INSTRUCTION BOOK

FOR

RADIO TRANSMITTING EQUIPMENT RC-52-D

MANUFACTURED BY

AIRCRAFT ACCESSORIES CORPORATION OF MISSOURI

U. S. A.

RESTRICTED

PUBLISHED BY AUTHORITY

OF

THE CHIEF SIGNAL OFFICER

ORDER NO. 5038—PHILA—42

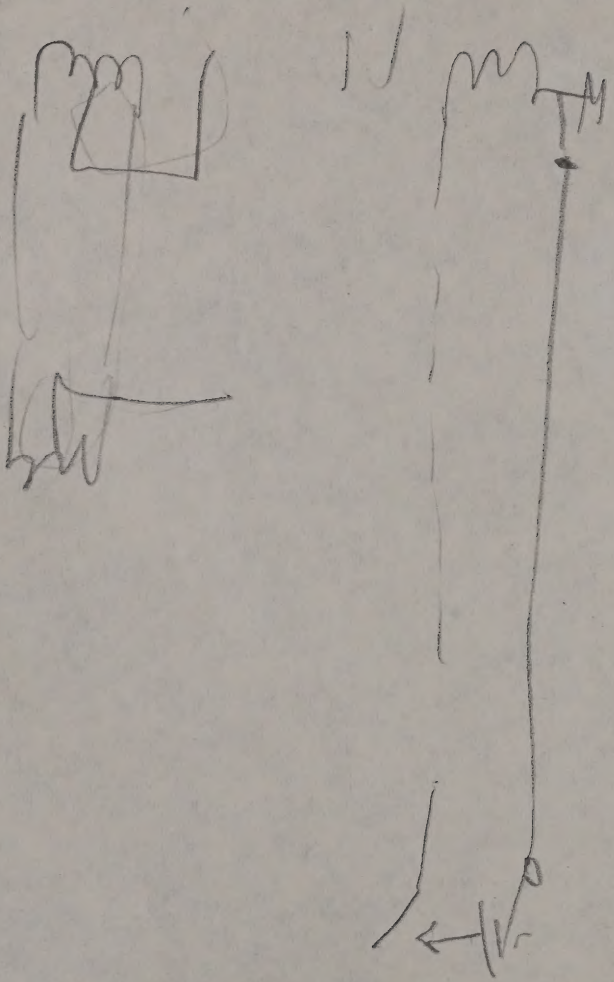
1 – microphone Shure – Hi-Z ~~SV-505~~

* 2 – 2 CKTS (4 wire) TAM – Rath

3 – 1 CKT (2 wire) rec. to oper

4 – 2 CKT oper to ~~navy~~ Pos.

* 1 CKT (audio sample)
1 CKT (2 DC legs.)



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SAFETY NOTICE

WARNING

HIGH VOLTAGE which is dangerous to life is used in this equipment. Precautions listed below must be observed before making any adjustments, connections or repairs.

MAIN LINE SWITCH on the rear of the cabinet must always be opened before any work is done within the transmitter. This operation removes voltages from all parts except the line terminals of this switch.

GROUNDING by means of a temporary connection, of the part being worked on, after power has been removed, is urged, whenever possible. Capacitors may retain a charge after power is turned off, should a bleeder resistor accidentally open.

TUBES OR FREQUENCY RANGE should be changed only after opening main line switch.

SAFETY INTERLOCK SWITCHES are provided on the front and rear removable panels. The side panels have no interlock switches and should *never be removed.*

DANGEROUS VOLTAGE CONNECTIONS are exposed when the dust cover is removed from the remote control unit. The cover has no interlock switch.

BIAS VOLTAGES: Opening of the interlock switches does not remove the bias voltages, which under certain conditions may be dangerous. Before changing tubes or frequency band, the main line switch should be opened.

CAUTION: After the switch contacts of main line switch, S1-B, have been opened by thermal action, damage to the switch may result if turned on before one minute has elapsed.

UTMOST CAUTION must be exercised at all times by operating personnel whenever engaged in work with this equipment. It is desirable that all operating adjustments be made in the presence of another person who can render, or quickly secure, first aid.

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a. Radio Transmitter BC-452-D.—

(1) Mechanical.—
Dimensions.—69″ High x 25″ Deep x 40″ Wide.
Weight.—1250 Pounds.

(2) Electrical.—

Power Supply.—
Voltage, 115 or 230 a-c Single Phase.
Frequency, 60 Cycles Only.
Power Consumption, 2.5 kw at 100% Modulation.
Power Factor, 0.88.
Current, 11.9 a at 230 v or 23.8 a at 115 v.

Audio Frequency (On Carrier).—
Response, Max. Variation: 3 db from 100 to 5000 Cycles Per Second.
Harmonic Distortion, 8% at 300 Watts Output, @ 400 Cycles Per Second.
Hum Level, –40 db.

Radio Frequency.—
Type of Emission, A1, A2, or A3.
Carrier Power Output, 300 Watts CW, MCW or Voice.
Output Will Match a 600-ohm Balanced Transmission Line.
Frequency Range, 1500 to 7000 kc in Four Bands.
Frequency Stability, 0.007% or Better.

(3) Vacuum Tube Complement.—

Symbol	Application	Commercial Type	U.S. Army Type
VT1-C	H. V. Rectifier	866-A	VT-46-A
VT2-C	H. V. Rectifier	866-A	VT-46-A
VT3-C	L. V. Rectifier	5Z3	VT-145
VT1-D	H. V. Rectifier	866-A	VT-46-A
VT2-D	H. V. Rectifier	866-A	VT-46-A
VT3-D	L. V. Rectifier	5Z3	VT-145
VT1-E	1st Audio	6K7	VT-86
VT2-E	2nd Audio	6C5	VT-65
VT3-E	Driver	2A3	VT-95
VT4-E	Driver	2A3	VT-95
VT5-E	Modulator	805	VT-143
VT6-E	Modulator	805	VT-143
VT7-E	Compressor	6R7	VT-88
VT1-F	Oscillator	837	VT-101
VT2-F	Buffer	807	VT-100
VT3-F	Power Amplifier	813	VT-144
VT4-F	Power Amplifier	813	VT-144
VT1-G	Tone Amplifier	6C5	VT-65
VT2-G	Tone Amplifier	6F6	VT-66
VT3-G	Tone Rectifier	5Z3	VT-145
VT4-G	Keyer	6C5	VT-65
VT5-G	Bias Rectifier	5Z3	VT-145

b. Remote Control Unit RM-22-D.—

(1) Mechanical.—
Dimensions.—10½" High x 14⅛" Deep x 19" Wide.
Weight.—66 Pounds.

(2) Electrical.—
Power Supply. —
Voltage, 115 v a-c Single Phase.
Frequency, 60 Cycles Only.
Power Consumption, 50 Watts.
Power Factor, 0.90.
Current, 0.5 a.

(3) Vacuum Tube Complement.—

Symbol	Application	Commercial Type	U.S. Army Type
VT1	Rectifier	5Z3	VT-145
VT2	Amplifier	6C5	VT-65
VT3	Tone Osc-Amp.	6F8	VT-99

2. PURPOSE.—

Radio Transmitting Equipment RC-52-D is a two channel radio transmitter suitable for CW telegraphy (type A1 emission), MCW telegraphy (type A2 emission), or radio telephony (type A3 emission), on any frequency from 1500 to 7000 kc. It is so designed that it may be started and stopped on either of two pre-set frequencies and the type of emission selected at will, either locally or from a remote point. Each equipment comprises two separate assemblies. Throughout this book, the term "TRANSMITTER" shall designate all the apparatus housed in the main cabinet (Radio Transmitter BC-452-D). This is a complete transmitting station including radio frequency, audio frequency power supply and control units. It can be operated with its panel controls and a local microphone or key. The term "REMOTE CONTROL UNIT" shall refer to the small cabinet (Remote Control Unit RM-22-D) designed for rack mounting which contains the additional apparatus necessary to control the "TRANSMITTER" from a remote point. MCW telegraphy can be operated only through the remote control unit. CW telegraphy or voice can be operated either locally from the panel controls of the transmitter or through the remote control unit.

Two-channel operation is obtained by utilizing two separate r-f units, each one complete from crystal to antenna terminals. Each has its own filament transformer but both operate from common power supply and audio units. Either can be selected at will but both cannot be operated simultaneously.

3. MECHANICAL ARRANGEMENT.—

a. Transmitter.—

The transmitter is assembled in a steel frame 69" high, 25" deep and 40" wide. Angle steel, 2"x2"x⅛" is used for the main framework and is braced with steel gusset plates and angle braces, resulting in an extremely rigid construction. Angle and channel steel pieces support the individual chassis. All joints are electrically welded.

Full length side panels have been bolted to the frame at the factory. They have no interlock switches. All operation, adjustment, and normal servicing of the transmitter can and should be done without removing them.

The rear of the frame has a full length and width panel which can be removed by slightly loosening the oven-head screws holding it in position, and lifting it upward until the screw heads will slip out of their inverted key holes. This panel is so designed that it cannot be removed with-

out difficulty until the main line switch is pulled to the "UP" or "OFF" position. Additional protection is provided by an interlock switch in the bottom center of this side. Removal of this panel enables all chassis except the lowest one to be taken out, as described under "MAINTENANCE AND REPAIR."

A full-width panel extends about two-thirds of the way up the front of the frame. It is provided with an interlock switch and can be removed for adjusting or servicing the transmitter. Above this panel, access doors open to allow adjustments of the r-f circuits. Meters, indicator lamps, and controls are mounted on the frame and are arranged around the access doors.

A perforated panel covers the top of the frame. Antenna terminals, one pair to the left and the other to the right of center, are mounted on this cover.

Forced draft ventilation is used and is in continuous operation whenever the transmitter filaments are lighted. Air is drawn in through the grill on the lower front of the cabinet, passes through the spun glass filter, circulates upward and out through the perforated top of the cabinet.

The lowest chassis is known as the "TRANSFORMER TRUCK" and extends nearly the full length and width of the cabinet, and contains the high voltage plate transformers and filter reactors of the 1500- and 1600-volt power supplies, the auto transformer, and the blower unit. It has built-in rollers so that it can be rolled out of the cabinet. The procedure for removing it is given under "MAINTENANCE AND REPAIR."

Above the transformer truck on the right side (when facing the rear of the transmitter), is the chassis containing the components of the 1600 v high voltage and 400 v low voltage power supplies, except the high voltage plate transformer and chokes, which are mounted on the transformer truck directly beneath. The 1500 v high voltage and 350 v low voltage supply components are on a similar chassis on the left side of the cabinet with their plate transformer and chokes also mounted underneath on the transformer truck. Both of these chassis can be removed from the rear of the cabinet. Removal procedure is given in "MAINTENANCE AND REPAIR."

The constant voltage transformer T4-A is mounted on the cabinet framework on a level with and in between the two power supplies.

Above the 1600/400 v power supply chassis (on the right side when facing the rear of the transmitter), is the chassis housing the voice amplifier and modulator components. Next to it on the left side is the bias supply and keyer unit chassis. Both of these chassis are also removable from the rear as described in "MAINTENANCE AND REPAIR."

The two r-f units are mounted in the top of the cabinet, one on each side. They are identical in every respect and interchangeable. A double-deck construction is used in each unit with the P.A. tank and the antenna matching network on the oscillator and buffer stages, common filament transformer, and P.A. tubes on the lower deck. The tuning chart and four tuning controls are mounted on a front panel common to both decks. Each r-f unit has its own filament transformer and antenna terminals and is independent of the other unit except that both use a common audio unit and power supply. Instructions will be found under "MAINTENANCE AND REPAIR" for removing these units through the rear of the cabinet. In the descriptive matter to follow, reference will be made to one r-f unit with the understanding that it applies equally as well to the other.

Openings are provided in both side panels for the passage of power and control wires as described under "INSTRUCTIONS FOR INSTALLATION."

Access to the fuse panel and connection terminal boards is obtained by removing the rear panel.

b. Remote Control Unit.—

The remote control unit is designed for mounting on a standard Western Electric Type 101-B 19-inch floor rack. Outside dimensions exclusive of the front panel are 10½" high, 14⅛" deep and 17⅜" wide.

Left and right side pieces are spot welded to the chassis and form a foundation for the dust cover which slips over the entire unit except the front panel. Chassis, side pieces, and dust cover

are constructed of 18 gauge cold rolled steel. The dust cover is removed by unscrewing four nuts on the rear of the unit. This dust cover is the only part necessary to be removed for adjusting or servicing the unit.

The front panel is fabricated from 1/8" cold rolled steel. It is bolted to the side pieces of the chassis, and is not intended nor designed to be removed after assembly at the factory. Dial designations are engraved on a separate plate which completely covers the front panel.

The attenuator control, db level meter, selector control switch, tone control switch, line switch, extractor fuse post, key and microphone jacks, and indicator lamp are mounted on the front panel. The control voltage tap switch and "TONE LEVEL" and "MCW LEVEL" controls are on the rear of the chassis and are fitted with adjusting knobs. All connections to the unit are made to a bakelite terminal board on the rear vertical chassis wall. A slot in the front edge of the dust cover furnishes an outlet for terminal board connections and permits the dust cover to be slipped on or removed without disturbing any wires.

4. OVERALL ELECTRICAL CHARACTERISTICS.—

a. Transmitter.—

(1) Power Supply and Line Requirements.—

The transmitter obtains all power from one alternating current, single phase power line. No batteries or extra generators are required. Provision is made for operating from either a 115-volt or 230-volt, 60-cycle source. All power passes through an auto transformer with a 115- and 230-volt input and an 80-, 85-, 90-, 95-, 100-, 105-, 110-, 115-, 120-, and 125-volt output. Directions will be found under "INSTRUCTIONS FOR INSTALLATION" for connection to 115- and 230-volt lines.

The two high voltage and two low voltage plate supply transformer primaries are grouped together electrically. They can be connected to any tap from 80 to 125 volts on the auto transformer by means of the tap switch on the front of the cabinet. The function of this switch is to permit all plate voltages to be varied from 70 to 110 per cent of normal.

All filament transformer and bias supply transformer primaries are grouped together electrically and connect to the output of a constant voltage transformer. The input of this transformer connects to the various taps on the auto transformer through another tap switch on the front of the cabinet. The primary purpose of this tap switch is to compensate for low or high line voltage, resulting in cooler and more efficient operation of the constant voltage transformer.

Neither side of the power line is grounded within the transmitter so that polarity need not be observed in connecting to the mains.

The line requirements of the transmitter are as follows:

Frequency	60 Cycles Only
Voltage	115 or 230 Volts
Power (CW, Key Up)	400 Watts
Power (CW, Key Down)	1.4 kw
Power (MCW or Phone, 100 per cent Modulation)	1.8 kw
Power (MCW or Phone, No Modulation)	1.4 kw
Power Factor	0.88

(2) Frequency Range.—

The frequency range covered by this equipment is continuous from 1500 to 7000 kc in four bands designated as follows:

Band A	1500 to 2000 kc
Band B	2000 to 3500 kc
Band C	3500 to 5000 kc
Band D	5000 to 7000 kc

Echo 112

The desired band is selected by connecting the coil taps and fixed condensers as detailed under "ADJUSTMENTS AND OPERATION."

(3) Radio Frequency Unit.—

Each radio frequency unit consists of three stages: a crystal oscillator, a buffer-doubler, and a power amplifier.

In this transmitter, the crystal oscillator circuit is always tuned to the fundamental frequency of the crystal. The buffer-doubler stage acts as a straight amplifier on bands A and B and as a doubler on bands C and D. The power amplifier acts as a straight amplifier on all bands. None of the stages requires neutralization.

(4) Keying.—

The transmitter is keyed by reducing the suppressor grid of the oscillator tube from a high negative, to ground or near ground potential. Except for receiver disabling, no relay or moving part is used in the transmitter or remote unit keying circuits. Thus, keying speeds up to 60 words per minute or more can easily be handled.

(5) Modulation.—

High level plate and screen modulation is employed in the final power amplifier. The audio system is capable of supplying 250 watts output without exceeding 8 per cent harmonic distortion. Separate windings on the modulation transformer for the plate and screen circuits of the modulated power amplifier permit 100 per cent linear modulation. The front panel db meter on both transmitter and remote control units should be adjusted at the time of installation so that 100 per cent modulation is attained when the meter reads zero level. See "ADJUSTMENT AND OPERATION."

(6) Power Output.—

The CW carrier power is 300 watts into a balanced, non-inductive load of 600 ohms. The carrier power on MCW and voice under the same conditions is also 300 watts. Output power on CW may be reduced by varying the output coupling. Reduction of power is not intended or recommended for MCW or voice because, (1) modulator tubes will be automatically switched out of service below 150 watts output, and (2), adjustment cannot be made for 100 per cent modulation.

(7) Controls.—

The transmitter is provided with a set of controls on the front of the cabinet. Provision is made for bringing microphone and key connections from a terminal board on the relay chassis, out through the side panel or bottom of the cabinet, and to the operator's desk. Proper connections are given under "INSTRUCTIONS FOR INSTALLATION."

Referring to the panel controls of the transmitter; the "LINE" control is a rotary tap switch that connects the constant voltage transformer primary to the power line through the various auto transformer taps. All filament transformer primaries and bias supply transformer primaries are connected to the secondary of the constant voltage transformer. The "PLATE" control is another rotary tap switch performing the same function for all plate supply transformer primaries. The "SELECTOR" control is a multi-gang switch, selecting local or remote operation and the type of emission. The "ATTENUATOR" control is a precision resistor assembly controlling the audio levels for voice operation. The "TEST KEY" moves from neutral position either up or down. It may be moved in either direction with the same results, the only difference being that the "UP" position is locking and the "DOWN" position non-locking. Since the center or neutral position of the "TEST KEY" is the electrical "KEY-UP" position, it will be referred to under that name in this book. Likewise, either the up or down positions of the "TEST KEY" are the electrical "KEY DOWN" positions, and will be referred to by that name. The "MICROPHONE" jack is for test purposes. It is intended that the permanent microphone connections be made to the terminal board at the rear of the transmitter. The green "FILAMENT," and red "PLATE" indicator lamps glow when their respective circuits are connected to the power line. The white "CHANNEL" indicator lamps glow one at a time indicating which r-f unit is in use.

b. Remote Control Unit.—

This unit is capable of controlling the main transmitter by means of four telephone wires and an earth ground. The remote operator may select CW, MCW or phone operation and may choose either of two pre-set frequencies. All functions of the transmitter which can be controlled locally can also be controlled from the remote point, except adjustment of filament and plate voltages, disengagement of the main line switch and adjustment of the transmitter panel attenuator control.

A choice of six modulating frequencies is possible for MCW. These are 400, 560, 720, 880, 1040, and 1200 cycles. The output is substantially constant over this range.

Keying speeds up to 60 words per minute or more can be handled by this unit. A receiver disabling device is included for the purpose of reducing the sensitivity of a monitoring radio receiver when tuned to the same frequency as the transmitter.

5. DETAILED DESCRIPTION OF COMPONENT UNITS.—

a. Constant Voltage Transformer.—

The filament transformer primaries and the bias supply transformer primaries are supplied through a constant voltage transformer in order to provide correct filament voltage for all values of line voltage between 95 and 130 volts. Over this range of line voltages, the output voltage of the transformer varies less than one per cent. The transformer is rated at 500 va and is operated at approximately 350 va.

It is fastened on two angle irons in the center of the cabinet, and directly between the two power supply chassis.

The transformer has three windings on a common core structure; a primary winding, a resonant or intermediate winding, and a compensating winding. The core has certain shunts and air gaps. A capacitor is built into the transformer case and is designed to form a series resonant circuit at 60 cycles in conjunction with the resonant winding. The three windings are so designed that the various voltages developed across them add vectorially to compensate for changes in line voltage.

The transformer is designed for operation at 60 cycles. Since its operation depends upon partial resonance, it is sensitive to frequency changes. Departures from the rated frequency result in corresponding changes in the output voltage level. These changes are directly proportional to the frequency, the constant of proportion being dependent upon several factors involved in the design of the transformers. For this reason it is recommended that the transmitter be operated only at 60 cycles.

b. Auto Transformer.—

Power to the whole transmitter passes through the auto transformer. It is constructed with input connections for 115 volts and 230 volts. The available output voltages for either of these inputs are 80 to 125 volts in 5 volt steps. The fan motor and the coil of the main filament contactor are permanently connected to the 115-volt tap of this transformer. Input voltages to the other circuits of the transmitter are adjustable through the tap switches on the control panel.

The purposes of the auto transformer are, (1) to permit variation of plate voltages from 70 to 110 per cent of normal, and (2), to permit adjustment of the input voltage to the constant voltage transformer. While this latter function is not a necessity it reduces the range over which the constant voltage transformer must operate, thus allowing it to run more efficiently. The auto transformer is mounted on the middle rear of the transformer truck.

c. Plate Voltage Power Supplies.—

(1) 1600-Volt Power Supply.

This power supply furnishes power only for the radio-frequency final power amplifier. Two VT-46-A half-wave, mercury-vapor rectifier tubes (VT1-C; VT2-C) are used in a conventional full-

wave circuit. The filter chokes are connected in the negative line, which avoids operating them at a high potential with respect to the framework of the transmitter.

The components of this supply form part of two chassis. The rectifier tubes, filament transformer, filter condensers, and bleeder resistor are mounted on a chassis about fourteen inches from the bottom and on the right side of the cabinet (when facing the rear of the transmitter). This chassis is referred to as the "1600/400-VOLT POWER SUPPLY." The high voltage plate transformer and the two filter chokes are mounted on the transformer truck directly beneath. The filament and plate transformers are each fused in their primary circuit, with the fuses mounted on the relay and fuse panel at the lower rear of the transmitter frame. Fuses F6-B and F8-B are for the plate and filament transformers respectively.

(2) 400-Volt Power Supply.—

This unit supplies voltage to the oscillator plate, buffer-doubler plate, and power amplifier screen grid circuits of both radio frequency units and to the tone amplifier tubes on the keyer chassis.

A VT-145 full-wave, high-vacuum rectifier tube is used in a standard full-wave circuit. The filter chokes are kept at a low potential with respect to the metal chassis by operating them in the negative line. All components, except fuses, are mounted on the same chassis with the 1600-volt power supply. The plate and filament transformer primary circuits are fused in conjunction with those of the 350-volt power supply as will be detailed in (4).

(3) 1500-Volt Power Supply.—

This power supply furnishes high voltage power for the VT-143 modulator tubes (VT5-E; VT6-E) only. Component parts and construction are identical to those used in the 1600-volt power supply except that a lower voltage plate supply transformer is used. The rectifier tubes, filament transformer, filter condensers, and bleeder resistor are mounted on a chassis about fourteen inches from the bottom and on the left side of the cabinet (when facing the rear of the transmitter). This chassis is generally referred to as the "1500/350-VOLT POWER SUPPLY." The high voltage plate transformer and the two filter chokes are mounted on the transformer truck directly beneath. Fuses F5-B and F9-B on the relay and fuse chassis are connected in the primary circuits of the high voltage plate and the filament transformers respectively.

(4) 350-Volt Power Supply.—

This plate supply serves the entire speech amplifier and VT-95 driver tubes (VT3-E; VT4-E). It is identical in components and construction to the 400-volt power supply described previously except that a lower voltage plate supply transformer is used. All parts, except fuses, are mounted on the same chassis with the 1500-volt power supply. The primary of the plate supply transformer is connected in parallel with that of the plate supply transformer of the 400-volt power supply and both are fused by F4-B on the relay and fuse panel. Likewise, the filament transformer primaries of the two low voltage power supplies are in parallel and fused with F10-B.

d. Bias Supply.—

A VT-145 full-wave, high vacuum rectifier tube (VT5-G) is used to supply fixed bias for the buffer-doubler and power amplifier, suppressor grid blocking voltage for the oscillator, and microphone current for local operation. A two-section filter with choke input is used for all current drawn from the supply, and an additional capacitor-inductor section is used for the microphone current. Five resistors in series form the bleeder for this power supply and at the same time permit the proper voltage to be tapped off for each transmitter circuit.

The bias supply and the keyer unit are on the same chassis, which is directly above the 1500/350 volt power supply in the left side of the cabinet (from the rear). Fuse F7-B serves both the bias supply and keyer filament transformer primaries.

e. Keying System.—

Keying is done in the oscillator circuit of this transmitter. Enough fixed bias is supplied from the bias unit to the buffer-doubler and power amplifier stages to cut off their plate current until they receive excitation from the oscillator. The quartz crystal remains in an oscillating condition as long as the oscillator has filament, screen grid, and plate voltage. However, the output of the oscillator tube plate circuit drops substantially to zero when a negative voltage of 250 is applied to the suppressor grid. Local keying is, therefore, accomplished by reducing the suppressor grid potential from –250 volts to zero. This causes the plate output to jump instantly from zero to maximum and excites the subsequent stages. This grounding operation can be done directly with a telegraph key at the local point but must be done electrically by means of the keyer tube from the remote control position. How this is done is explained in the next section.

Attention should be called to the fact that the carrier is not keyed but runs continuously during MCW operation. The tone signal input to the modulator is keyed at the remote control unit. This system of MCW reduces key click radiation from the transmitter to a minimum.

f. Keyer Unit.—

The purpose of this unit is to enable keying of the transmitter from a remote point.

Keying impulses come to the transmitter over a pair of telephone wires from the remote point in the form of pulses of tone. The frequency may be any of the six from 400 to 1200 cycles per second selectable from the remote control unit. The tone pulses are amplified through a VT-65 (VT1-G) resistance coupled to a VT-66 tube (VT2-G). Both stages are strictly conventional audio amplifiers. The VT-66 (VT2-G) output is coupled through a special transformer to the plates of a VT-145 (VT3-G). The tone pulses are rectified by this tube and then passed through a special low pass filter unit X4-G. They emerge from this filter as pulses of well-filtered direct current. Now they will be referred to as keying pulses.

The keyer tube VT4-G may be described as an electronically variable resistor. It is connected from the oscillator suppressor grid to ground. When no keying pulse is coming through, it is merely a very high resistance connected from suppressor to ground. When the remote key is depressed, it becomes a low resistance and almost short circuits the suppressor to ground. The manner of its operation is as follows:

The tube is connected with its plate grounded and with the suppressor grid of the oscillator connected to its cathode. A voltage of minus 250 is always applied to the oscillator suppressor which causes the cathode of the keyer tube to be at 250 volts potential negative with respect to the plate. The tube would draw current were it not for the 275 volts negative applied to its control grid, which almost completely cuts off the plate current and causes the tube to act as a very high resistance.

The keying pulses, after emerging from the special filter unit X4-G, are applied between the control grid and cathode of the keyer tube, the positive side to the grid. When a keying pulse comes through, the pulse causes the control grid of the keyer to become positive with respect to cathode and the tube resistance drops to a low value. The plate resistance of the tube and the resistor R7-G, are the two legs of a voltage divider with the suppressor voltage tapped off at their common point. Key up, the tube resistance is high in comparison with R7-G, allowing a nearly 250-volt negative potential to be applied to the oscillator suppressor grid, thus effectively blocking the oscillator plate output. Key down, the tube resistance drops very low in comparison with R7-G, reducing the suppressor voltage to about —20 volts. This permits the oscillator plate circuit to deliver full output to the succeeding stages.

g. Radio Frequency Unit.—

(1) Oscillator.—

A VT-101 tube (VT1-F) is employed in the oscillator. Although it is possible to operate the plate circuit of this stage on harmonics of the crystal frequency, the stage was designed and is recommended to be operated only on the fundamental crystal frequency. The oscillating circuit includes

the crystal, bias resistor R1-F, grid to cathode circuit of the tube, coil L1-F, and capacitor C1-F. It will be noted that L1-F and C1-F form the oscillating tank circuit. Thus, the crystal may be oscillating if there is plate, screen, and filament voltage on the tube regardless of what the suppressor voltage may be. The output of the oscillating circuit is coupled by the internal electron stream to the plate or output circuit of the tube. Application of a high negative bias on the suppressor grid of the tube causes the plate circuit output of the tube to drop to zero.

The dropping resistor R2-F furnishes screen grid voltage from the 400-volt power supply. C3-F and C4-F are the screen grid and plate circuit by-pass capacitors respectively. Power is series-fed through the tank circuit L2-F and C5-F to the plate of the tube.

Panel meter M1-A reads combined grid, screen grid, and plate current of the stage since it is in the cathode circuit. Capacitor C1-A serves to keep r-f current out of the meter.

The frequency range of the oscillator is from 1500 to 3500 kc and is covered without changing coils, coil taps, or capacitors.

(2) Buffer-Doubler.—

A VT-100 tube (VT2-F) is used, capacitively coupled through C6-F to the oscillator plate circuit. The grid resistor R3-F develops bias voltage when the tube is excited. This in addition to the fixed bias furnished by the bias power supply. Screen grid voltage is obtained through the voltage divider resistors R4-F and R5-F from the 400-volt power supply. Capacitor C21-F maintains the screen at ground r-f potential. Panel meter M2-A is connected in series with the cathode circuit, and reads combined grid, screen grid, and plate current. Capacitor C2-A prevents r-f current from flowing through and damaging the meter.

This tube functions as a straight r-f amplifier from 1500 to 3500 kc and as a frequency doubler from 3500 to 7000 kc. Because of the very low control grid-to-plate capacity, it requires no neutralization over the entire frequency range.

The plate circuit is shunt-fed through the r-f choke L6-F, and is capacitively coupled through C8-F to the grid circuit of the power amplifier.

(3) Power Amplifier.—

Two VT-144 tubes (VT3-F; VT4-F) are used in a balanced push-pull circuit. Components L3-F, C9-F, C10-F, and C11-F form the tuned grid circuit of the power amplifier and in conjunction with C8-F, the tuned plate circuit of the buffer-doubler tube. The frequency range of these circuits is 1500 to 7000 kc in four bands. Band A uses the full inductance of the coil L3-F, plus the mica capacitors C9-F and C10-F, each one in parallel with one section of the split stator capacitor C11-F. Bands B, C and D each use C11-F with portions of the coil L3-F shorted. Capacitors C12-F, C13-F, and C14-F, are two filament by-pass capacitors and one screen by-pass capacitor, respectively. Screen voltage is supplied directly from the output of the 400-volt power supply. Beam forming elements of both tubes are connected to ground. The plate circuits are shunt-fed through chokes L7-F and L8-F, and coupled to the output circuits through the blocking capacitors C15-F and C16-F. No neutralization of this stage is required over the entire frequency range of 1500 to 7000 kc.

Components L4-F, L5-F, C17-F, C18-F, C19-F, and C20-F serve as a combined plate tank circuit and antenna matching network. C18-F is designated as the plate tuning capacitor and is of the split-stator type. C19-F and C20-F are air dielectric, fixed capacitors and each may be paralleled with one section of C18-F, using link connections. C17-F is designated as the antenna loading capacitor. Band A uses the full inductance of L4-F and L5-F tuned with C19-F and C20-F in parallel with C18-F. Bands B, C, and D use C18-F alone, tuning portions of L4-F and L5-F, the unused portions being shorted out. The output is taken from the loading capacitor C17-F through the panel r-f ammeter to the antenna terminals on top of the cabinet. Two static drain r-f chokes are connected in series across the antenna terminals and have their center point grounded. These chokes protect personnel, who may be adjusting or servicing the transmitter, by draining off energy accumulated in the

antenna matching network. Each r-f channel filament transformer is fused separately, F13-B for channel 1 and F12-B for channel 2.

h. Speech Amplifier and Modulator.—

Two transformers, T1-A and T2-A, are used for matching the signals to the first amplifier grid. Both are mounted on the cabinet of the transmitter and can be disconnected from the amplifier chassis, whenever its removal is required, by disengaging three friction caps which slip over studs mounted on the chassis. Transformer T1-A matches the tube grid impedance to the 600-ohm modulator telephone line from the remote unit, when the "SELECTOR" switch is in the center or remote position. For local voice operation, it is connected by the "SELECTOR" switch to the microphone through T2-A which is a 600-ohm to 200-ohm matching transformer. The front panel db level control is a precision resistor assembly connected across transformer T1-A secondary so that adjustment of speech amplifier input level can be made from the panel of the transmitter. The speech amplifier and modulator unit should be adjusted after installation so that 100 per cent modulation is obtained with the panel db meter showing zero level. See "ADJUSTMENT AND OPERATION."

The input stage employs a VT-86 tube connected as a triode. R6-E is a plate voltage dropping resistor, R4-E the plate load resistor, R3-E the cathode bias resistor, and C6-E and C2-E are the plate circuit and cathode by-pass capacitors respectively.

Excitation of the second stage (VT2-E) is variable by R16-E which is coupled to the preceding stage by capacitor C5-E. R10-E and C8-E are respectively the plate voltage dropping resistor and its associated by-pass capacitor. The tube is self-biased with R9-E and C7-E.

The third or driver stage uses two VT-95 tubes (VT3-E; VT4-E) in push-pull, coupled through transformer T2-E to the second stage. This transformer has an additional winding of 600 ohms shunted with resistor R11-E to supply voltage for the panel db meter. R11-E is adjusted at the time of installation to indicate zero level when the r-f power amplifier is delivering rated power output at 100 per cent modulation. See "ADJUSTMENT AND OPERATION."

The final modulator stage has two VT-143 tubes (VT5-E; VT6-E) in a class B circuit. The wiring is quite conventional and needs no comment except that the modulation transformer T4-E has separate output windings for simultaneously modulating plates and screen grids of the r-f power amplifier. A description of the bias system is given under "Modulator Protective Circuit," Section A-5-i-(7).

The speech amplifier contains a compressor circuit, the purpose of which is to reduce high audio peaks, permitting a greater *average* audio level at 100 per cent modulation. A VT-88 tube (VT7-E) is employed which contains two diodes and a triode section in the same envelope. Audio from the plate circuit of the second stage is coupled to the control grid through capacitor C4-E. It is amplified in the plate circuit and coupled through transformer T5-E to the diode circuit which, in conjunction with the center tapped secondary winding of T5-E, forms a full-wave rectifying circuit. The negative side of the d-c output from the rectifier is applied to the control grid of the first speech amplifier stage. The resistors R1-E, R2-E and capacitors C1-E, C9-E are a resistance-capacity filter network for the pulsating d-c output of the rectifier.

The action of the compressor is as follows: An increase in input level to the first audio stage is amplified through the VT-86 and VT-65 tubes (VT1-E and VT2-E), and is applied to the compressor tube VT7-E. The result is an increase in d-c output which accordingly raises the grid bias on the first audio tube and reduces its gain. Resistor R13-E provides correct bias for the triode section of the compressor tube VT7-E. R14-E furnishes additional bias for the diode section. Sufficient diode bias is supplied by a selection of R14-E to render the compressor circuit ineffective until 70 per cent modulation has been reached. When the compressor control, R12-E, has been properly adjusted, a 10 db increase in input level to the speech amplifier, after 70 per cent modulation has been reached, will result in only a 3 db increase in the audio level on the carrier.

R16-E is the amplifier gain control. It may be necessary to adjust this control occasionally to compensate for decreased emission of the VT-86 and VT-65 tubes (VT1-E; VT2-E) or slight variations in characteristics of a different brand of replacement tube. Directions for simultaneously adjusting the "COMP", "GAIN", and "DB" controls are given under "ADJUSTMENT AND OPERATION."

i. Transmitter Control Circuits.—

(1) Channel Control.—

Each r-f unit is supplied with its own crystal, tubes, and filament transformer. Plate, screen grid, and bias voltages are connected at all times to both r-f units, and each has a separate transmission line permanently connected to its output terminals. Changing from one channel to the other is done by energizing the filament transformer of the desired channel.

(2) Main Line Switch S1-B.—

The main line switch S1-B is three pole, single throw. Only two poles are used at any one time, however, since one controls the common, and the other two the 115-volt or 230-volt line connection, whichever is being used. Opening this switch removes both sides of the power line from all apparatus within the transmitter cabinet.

Additional protection for the transmitter is provided by the thermal overload coils built in as a separate part of this switch. In the event of more than 30 amps. from a 115-volt or 18 amps. from a 230-volt source being drawn for a few seconds, the switch contacts are opened without, however, the handle being thrown. To re-set, the handle must be moved to the "UP" or "OFF" position and then back to the "DOWN" or "ON" position. After the switch contacts have been opened by thermal action, damage to the switch may result if it is turned on before at least one-minute has elapsed.

(3) Filament and Plate Contactors K4-B and K8-B.—

All filament and bias supplies and the fan motor are grouped to operate through contactor K4-B known as the filament contactor. All plate supplies are grouped together through plate contactor K8-B. Each has double-pole contacts controlling both sides of the line. 115-volt coils permit operation directly from the auto transformer.

(4) Overload and Time Delay Relays K6-B, K7-B, and K5-B.—

Two overload relays K6-B and K7-B are provided, the first in the 1600-volt supply to the r-f power amplifier and the second in the 1500-volt modulator supply. The coil of each is connected in the negative-to-ground lead of its power supply. They are so connected with time delay relay K5-B that an overload in either circuit will cause plate contactor K8-B to open and time delay K5-B to open and start re-timing. Filament and bias circuits are not affected. Each overload relay is adjusted at the factory to open on a current of 800 ma.

The time delay relay is of the mercury plunger type and closes after a 30 to 37 second time interval. It will re-time for the full period after only a half second break in its exciting coil circuit. There are no adjustments.

(5) Relay Power Supply.—

A dry rectifier power supply is included on the relay and fuse panel. Its purpose is to provide 60 to 85 volts for operating channel selector relays K1-B and K2-B and modulator filament control relay K3-B. Although these relays have coils rated at 40 volts d-c, higher voltage is required since they are operated through a long telephone line simplex circuit, and part of the voltage is lost in the line.

A tapped transformer T1-B delivers 105, 90, 75, and 60 volts to the bridge-type dry rectifier A1-B. Pulsating d-c output is filtered by X1-B and C1-B.

(6) Interlock Switches and Thermostat.—

Push-type SPST interlocks are mounted, one in the middle front, and the other in the lower rear of the transmitter cabinet, so that removal of either the front or rear panels will disconnect the 1600/400- and 1500/350-volt plate supplies.

CAUTION: OPENING OF THE INTERLOCK SWITCHES DOES NOT REMOVE THE BIAS VOLTAGES, WHICH UNDER CERTAIN CONDITIONS MIGHT BE DANGEROUS. BEFORE CHANGING TUBES OR FREQUENCY BAND, THE MAIN LINE SWITCH SHOULD BE OPENED.

A thermostat of the circuit opening type is mounted in the exhaust air stream near the top of the cabinet. Its purpose is to protect the transmitter from damage by overheating due to such exceptional causes as failure of a fan circuit fuse. All filament, bias, and plate voltage circuits open when the cabinet temperature reaches 55 degrees centigrade; they are restored when the temperature has fallen 1 degree.

(7) Modulator Protective Circuit.—

An underload relay is incorporated in the transmitter to protect the modulation transformer from peak voltages developed by the modulator tubes in the event of r-f power amplifier plate current decrease or interruption. Operating bias for the modulator stage is developed across resistor R1-B, which is in the negative-to-ground circuit of the r-f power amplifier plate supply. The voltage developed across this resistor also holds contactor K9-B closed, which in turn shorts out bias resistor R2-B. If the plate current of the r-f power amplifier drops below 200 ma, the voltage across R1-B is no longer great enough to hold K9-B closed and resistor R2-B is automatically injected into the filament return circuit of the modulator tubes, so increasing the bias that they become practically inoperative.

(8) Inter-Unit Control System.—

The transmitter and the remote control unit must be connected by four telephone wires (two lines), and each unit must have a good earth ground. The four control circuits used are: (1) Tone keyer telephone line consisting of two metallic conductors neither of them grounded. This circuit is used to turn on the carrier either intermittently for CW operation or hold it on continuously for MCW or voice operation. Pulses of tone operate the keying circuit at the transmitter end as described in sections 4-e and 4-f. (2) Modulator telephone line of two metallic conductors neither of them grounded. This line couples the output of the pre-amplifier tube VT2 in the remote control unit to the input of the speech amplifier and modulator at the transmitter. It carries speech energy from the remote microphone for voice operation and keying pulses from the remote tone oscillator for MCW operation. It is not used for CW transmission. (3) A "SIMPLEX" circuit using the center tap of the terminating winding of the tone keyer telephone line at each end for one line, and the earth as a return conductor. (4) Another "SIMPLEX" circuit utilizing the center taps of the modulator telephone circuit, and the earth as a return conductor. Control circuits (3) and (4) are used to select channel 2 and channel 1 respectively. They are also used to turn on the modulator for MCW and voice operation. If circuit (3) is used to select channel 2, then circuit (4) controls the modulator. When circuit (4) selects channel 1, circuit (3) controls the modulator.

(9) Panel "SELECTOR" Switch S2-A.—

During the detailed description of the "SELECTOR" switch which follows, reference will be made to Figure 27, Schematic Diagram.

This switch has three functions: (1) Selecting the r-f channel, (2) selecting the type of emission (CW or voice), and (3), transferring control to the remote unit. With the switch in the center position (vertical), local key and microphone circuits are rendered inoperative and the transmitter is receptive to signals from the remote point. The first position to left of center prepares the transmitter for CW operation from the local control point on channel 1; the first position to right prepares it for local CW operation on channel 2. The second positions to left and right of center permit local voice operation on channels 1 and 2 respectively.

Seven circuits are simultaneously controlled with this switch. Each circuit is lettered on the schematic diagram in order that reference may be made to it in the text. These letters do not appear on the switches. A detailed description of these circuits is given here.

(a) "SELECTOR" in Center or Remote Position.—

Circuits A and B connect the tone keyer telephone line to the keyer amplifier input transformer.

Circuit C is open, leaving the suppressor grid circuit of the oscillator free to respond to keying impulses coming over the tone keyer telephone line and through the keyer tube VT4-G.

Circuit D is open, leaving the remote operator to control the modulator filaments.

Circuit E is open, leaving the remote operator to choose the proper r-f channel.

Circuits F and G connect the voice telephone line to the speech amplifier input transformer.

(b) "SELECTOR" in CW, Channel 1 Position.—

Circuits A & B disconnect tone keyer telephone line from keyer amplifier input transformer.

Circuit C connects the oscillator suppressor grid so that it can be keyed to ground through test key or properly connected external key, thus turning on the carrier.

Circuit D is open, leaving the modulator filaments unlighted.

Circuit E selects channel 1 and operates as follows: Current from the output of the selenium rectifier power supply, which is mounted on the relay and fuse panel, passes through circuit E, normally closed contacts of K2-B, through the energizing coil of the channel contactor K1-B, and back by way of chassis ground to the selenium rectifier power supply. When K1-B is energized, its normally closed contacts open, interrupting the circuit through the energizing coil of the channel 2 contactor, one set of normally open contacts close, supplying power to the primaries of all filament, plate, and bias supply transformers except those of the modulator and r-f units, and another set of normally open contacts close, supplying power to channel 1 transformer primary.

Circuits F and G are open, leaving the input to the voice amplifier disconnected.

(c) "SELECTOR" in Voice, Channel 1 Position.—

Circuits A & B disconnect remote tone keyer telephone line from keyer amplifier input transformer.

Circuit C connects the oscillator suppressor grid so that it can be grounded with the local microphone push-to-talk button, thus turning on the carrier.

Circuit D closes, completing the energizing circuit of contactor K3-B through a set of contacts on K1-B. Contactor K3-B furnishes power to the modulator filament transformer primary.

Circuit E operates as already described for CW channel 1.

Circuits F and G connect the 600-ohm primary of the speech amplifier input transformer T1-A to the local microphone jack through the 600-to-200-ohm matching transformer T2-A.

(d) "SELECTOR" in CW, channel 2 Position.—

All circuits operate as in CW, channel 1 position except that contactor K2-B operates in place of K1-B, causing the filaments of r-f channel 2 to be energized.

(e) "SELECTOR" in Voice, Channel 2 Position.

All circuits operate as in voice, channel 1 position except that contactor K2-B instead of K1-B is energized causing the filaments of r-f channel 2 to be energized.

j. Remote Control Unit.—

(1) Tone Oscillator.—

A VT-99 dual triode tube (VT-3) is used, one section as a modified Hartley oscillator and the other as an audio amplifier. Transformer T3 and the capacitors C8 to C14 are the oscillating com-

ponents. Energy is coupled through capacitor C17 from the oscillator plate to the amplifier grid, the magnitude being controlled by potentiometer R13. The amplifier output transformer has two secondary windings, one a center-tapped winding to match a 600-ohm telephone line, and the other a 600-ohm winding for coupling the tone signals to the grid of VT2 for MCW. The second winding is shunted by potentiometer R14 for regulating the input to VT2.

Component K1 is a receiver disabling relay and is in series with the plate circuit of the tone amplifier tube. Single-pole, double-throw contacts are used to provide either a normally open or normally closed line for reducing the sensitivity of a monitoring receiver while the transmitter carrier is operating.

Capacitors C8, C9, C10, C11, C12, and C13 are selected by switch S3 to provide tone frequencies of 400, 560, 720, 880, 1040, and 1200 cycles per second, respectively. Because of slight variations in characteristics of the oscillation transformer T3, capacitors C8 to C13 have been individually selected for each remote unit. In some cases, several capacitors have been paralleled to obtain the correct value of capacity to produce the desired tone frequency. The output of the oscillator section is held constant over the frequency range by using a special bias resistor for each frequency. These resistors are also individually selected for each unit. The tone control capacitors and their respective bias resistors R7 to R12 are both controlled simultaneously by S3, a two-section, six-position switch.

(2) Pre-Amplifier.—

The microphone connects through its input transformer T2 to the grid of a VT65 tube (VT2), known as the pre-amplifier. Energy is also coupled to this grid from the output of the tone amplifier. Provision is made for applying to this tube fixed cut-off bias obtained from the voltage divider combination R15 and R16. This bias can be removed and the tube restored instantly to normal operating condition by grounding the mid-point of R15 and R16. Cut-off bias is applied continuously during CW operation, between keying impulses for MCW operation, but not at all for voice operation.

(3) Microphone and Key Click Filter.—

Reactor X3 and capacitor C3 form an additional filter section for microphone current, which is obtained from a voltage divider R1 and R2 across the power supply. Reactor X4 and capacitors C5 and C6 constitute a key-click filter for use on MCW.

(4) Selenium Rectifier Power Supply.—

Direct current power for operation of the simplex control circuits is furnished by a tapped winding on the main power transformer, and a bridge type selenium rectifier, and is filtered by reactor X5 and capacitor C7. Voltages obtained from the transformer through taps are 105, 90, 75, and 60 volts, which under normal load yield 85, 73, 60, and 48 volts d-c after filtering. The higher voltage taps can be used for higher resistance or longer telephone control lines.

(5) Microphone and Key Connections.—

Microphone and key connections may be made through the front panel jacks or to the terminal board on the rear of the chassis. See "ADJUSTMENT AND OPERATION."

(6) Power Supply.—

Power is obtained from a 115-volt power line through transformer T1. Besides the tapped winding for the dry rectifier power supply, there is a 6.3-volt filament winding for VT2 and VT3, a 5.0-volt filament winding for the rectifier tube VT1, and a center-tapped high voltage plate winding. A conventional rectifier and filter circuit with a VT145 full-wave rectifier tube (VT-1) and a two-section, choke input filter is used. Under full load, approximately 275 volts d-c is obtained.

(7) Indicator Lamp.—

Indicator lamp I1 contains a 115-volt, 6 watt bulb behind a red disc. It is connected directly across the power transformer primary so that it will not light if either switch S1 or fuse F1 is open.

(8) "SELECTOR" Switch.—

The "SELECTOR" switch S2 is a six-pole, seven-position rotary switch. In the center (vertical) position, no control signals are emanating from the unit, and the transmitter filament and plate circuits are dead. The three positions to the left of center are CW, MCW, and voice, channel 1, in that order, and the three positions to the right are CW, MCW, and voice, channel 2, respectively. Referring to the schematic diagram of this unit, the six circuits are lettered so that reference may be made to them in the text. These letters do not appear on the switch. A detailed description of these circuits follows:

(a) CW Channel 1 Position.—

Circuit A connects d-c voltage to the simplex circuit on the modulator telephone line. At the transmitter, this turns on all filament and plate voltages except the filaments of the speech amplifier and modulator, and r-f channel 2.

Circuit B connects the key ready to operate. When the key is depressed, the cathode circuit of the tone amplifier section of VT3 is completed to ground, and an audio tone goes to the transmitter keyer unit through the tone keyer telephone line.

Circuits C, D, E, and F are not used.

Summarizing for CW Channel 1 Operation:

The simplex circuit of the modulator telephone line is used to operate the channel 1 relay at the transmitter, and the tone keyer telephone line carries audio keying pulses.

(b) MCW Channel 1 Position.—

Circuit A operates exactly as on CW channel 1.

Circuit B inserts the key ready to operate. When the key is depressed, it grounds the cathode circuit of the pre-amplifier tube VT2 through the key click filter, thus removing the fixed cut-off bias and rendering it operative.

Circuit C completes the cathode circuit of the tone amplifier section of VT3 to ground. A continuous tone signal is sent to the transmitter, turning on the r-f carrier.

Circuit D connects a portion of the tone output from the plate circuit of VT3 to the grid circuit VT2. When the key is depressed, rendering VT2 operative, as explained under circuit B of this section, a pulse of tone travels over the telephone line to the speech amplifier and modulator at the transmitter.

Circuit E is not used.

Circuit F grounds the remote end of the tone keyer line simplex circuit, energizing K3-B at the transmitter and turning on the modulator.

Summarizing for MCW operation:

Tone keyer telephone line carries a continuous tone signal which holds the r-f carrier steadily on the air. Modulator telephone line carries pulses of tone to the audio system of the transmitter which modulate the carrier in accordance with the keying. Modulator line simplex circuit has selected channel 1 and tone keyer line simplex circuit has turned on the modulator filaments.

(c) Voice, Channel 1 Position.—

Circuit A operates exactly as for CW and MCW.

Circuit B is not used.

Circuit C grounds the midpoint of R15 and R16, removing the cut-off bias from the microphone pre-amplifier tube VT2, permitting it to become operative.

Circuit D is not used.

Circuit E connects the push-to-talk microphone switch, enabling the carrier to be turned on by completing to ground the cathode circuit of VT3.

Circuit F operates exactly as for MCW.

Summarizing for Voice Operation:

All inter-unit control circuits perform the same function as for MCW, except that the modulator line now carries voice signals to the modulator instead of keyed tone signals.

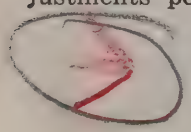
(d) Channel 2 Operation.—

All circuits function in the same way as for channel 1 operation except that the simplex circuit of the tone keyer line is used to turn on filament and plate voltages for channel 2 and the modulator filaments are controlled by the modulator line simplex circuit.

(9) Level Controls.—

R4 is a precision resistor assembly identical to that used on the main transmitter. It is used to adjust the microphone level and is used only for voice operation.

R13 and R14 are the "TONE LEVEL" and "MCW LEVEL" controls respectively. Both are on the rear of the chassis and have knob adjustments. After installation of this equipment in a permanent location, these controls require an initial adjustment. It may be necessary to make subsequent adjustments periodically. Complete directions are given under "ADJUSTMENT AND OPERATION."



B. INSTRUCTIONS FOR INSTALLATION

All chassis are removed and shipped separately. The complete equipment is contained in 7 boxes. These instructions describe the installation of a completely disassembled equipment.

1. UNPACKING.—

Each box should be opened carefully and by means of the proper tools. Steel strapping can be broken by prying up the band slightly with a claw hammer and then cutting it with tinsnips. The contents of nearly all boxes except the largest can be removed by opening any one of the four sides with a nail puller or claw hammer and wrecking bar. To open some of the boxes it may be necessary to remove a second side. This can be determined whenever the equipment fails to come out easily after the removal of a single side. It is important to remove the equipment from the box before taking off any wrapping or packing material.

2. ASSEMBLY INSTRUCTIONS.—

The transmitter may be installed in any place where a minimum clearance of two and a half or three feet may be reserved on all sides to facilitate removal of chassis for adjustment or servicing.

The transmitter should be set flat on the floor with no air space between cabinet and floor; such an air space might impair the air cooling system within the cabinet.

If the transmitter is to be fastened down, holes should be drilled in the floor corresponding to those in the frame. Dimensions are given in the floor plan of Figure 26. The size of control wire and power line cables, if they are brought through the floor, will govern the size of the holes drilled to accommodate them. Hardware to be used in assembling the station will be found in cloth bags in the accessory box.

a. Box 1.—

This box contains the transmitter frame with panels mounted in position, but with all chassis, except the relay and fuse panel, removed and shipped in separate boxes. One double filter for the blower unit, one box of accessories, two boxes of tubes, each containing a complete set of tubes for the equipment, and the constant voltage transformer are shipped inside the cabinet. The accessory box includes:

2—Microphones

2—Preliminary Instruction Books

4—Antenna Lead Out Insulator Assemblies

2—Cloth Bags Containing:
- 16—4 1/2″ 10-32 Chassis Hold-Down Screws
- 8—6″ 10-32 Chassis Hold-Down Screws
- 5—3/8″ 10-32 Flat Head Screws
- 2—Side Panel Cover Plates
- 2—Rear Door Handles Complete with Hardware

The box should be placed as near the final position of the transmitter as possible before being opened, so as to avoid marring the cabinet finish in moving. Carefully open the box as previously described and pull out the cabinet. Remove the front and rear cabinet panels and set them aside until all chassis have been installed. Do not remove the top and side panels. Shipping blocks may now be taken out, tube and spare parts boxes removed, and the masking tape pulled off fuses, relays, leads, etc.

At this point it is advisable to connect the incoming control wires and power line, if they are ready, as their installation will be more difficult after the lowest chassis has been installed. Telephone and local key and microphone wires should enter the transmitter at the bottom on the left

side (when facing the rear of the transmitter) and may come in either through the cut-out in the side panel, or up through the floor into the open bottom of the cabinet. It will be noted that two different covers are furnished for the opening in each side panel. One is a plain cover for use if the wires are brought up through the floor underneath the cabinet. The other has conduit cut-outs for use if the wires are brought in the sides of the cabinet. A hole is provided in the relay panel for bringing the wires to the amber bakelite terminal board, in the lower left-hand corner of the transmitter (when facing the rear.) Connections are made as follows:

Terminals	Use
1 & 3	Tone keyer telephone line; no polarity.
2	Center tap of 1 & 3; no external connection.
4 & 6	Modulator telephone line; no polarity.
5	Center tap of 4 & 6; no external connection.
7	Microphone button connection.
8	Microphone push-to-talk connection.
9	Key line.
10	Ground; return circuit for terminals 7, 8, & 9.

It may be necessary to temporarily dismount the terminal board from the relay panel while bringing in the control wires.

Power supply wires should enter the transmitter in a similar manner to the control wires, but on the opposite side, and fasten to the small bakelite terminal board in the lower right-hand corner of the transmitter. SPECIAL CARE SHOULD BE EXERCISED WHEN CONNECTING TO A 230-VOLT POWER LINE. IMPROPER CONNECTIONS MAY RESULT IN EXTENSIVE DAMAGE TO THE TRANSMITTER. Polarity need not be observed but it is extremely important that a 230-volt power line should not be wired to the 115-volt terminals.

The antenna insulator assemblies may now be mounted in position on top of the cabinet. Tighten them only enough to prevent sidewise slipping. Too much pressure may strain the cup insulators, causing them to break later. The two handles should be mounted on the rear panel with the nuts and washers supplied with them.

The constant voltage transformer has been bolted to the shipping crate. It is to be mounted in the center of the cabinet, just above the transformer truck, on two steel angles. Mounting bolts are shipped in their holes. The end of the transformer with the bushings or sockets must be to the rear of the cabinet.

If a "SOLA MFG. CO." transformer has been furnished with the transmitter, remove its rear end plate, exposing the "INPUT" and "OUTPUT" terminals. Thread the cable wires through bushings on each side of the transformer. Fasten two wires, a small WH-RD one and a large WH-OR-GN-BL one to each "INPUT" terminal. Fasten a WH-YL-GN-BL wire to each "OUTPUT" terminal. No polarity need be observed in making these connections.

If a "THORDARSON MFG. CO." transformer has been furnished, make connections the same as for the Sola transformer.

b. Boxes 2 and 3.—

One r-f unit is shipped in each of these boxes. They are identical in every respect and each should be mounted in the top of the cabinet on the side which will avoid cross-over in antenna connections. Insert them from the rear and fasten them to the framework with bolts from the hardware bag.

NOTE: Unless all chassis are bolted solidly to the frame, erratic operation of the transmitter may result.

Cabinet cable wires should connect to the terminal board lugs for which they were intended. Check each connection against the wiring diagram, Figure 35, and the wiring chart fol-

lowing the wiring diagram. The bus wire from the panel r-f ammeters, M5-A and M6-A, should be connected to their respective antenna insulator connections. The two short bus wires from the r-f chokes, L1-A, L2-A, L3-A and L4-A should be connected to the square post insulators on the r-f chassis.

c. Box 4.—

This box contains the bias supply and keyer chassis, and the voice amplifier and modulator chassis.

The voice amplifier and modulator chassis should be inserted through the rear of the cabinet to a position below the R-F unit on the right side of the frame. Fasten it to the frame with four bolts from the hardware bag. Each wire of the cabinet interconnecting cable should be fastened to the terminal board lug for which it is obviously meant. Note that two lugs connect to the "1600"-volt terminal, one with a WH-RD-OR-YL wire and the other with a WH-BK-RD-OR wire. Three connections from the front panel of the cabinet to this chassis should be made with the clip leads attached to the front panel. Turbo insulation may have to be pushed back temporarily from the friction clips to expose the color code of the wires. The wire from the rotor of R1-A (green dot on insulating sleeve) fastens to the grid cap of VT1-E; the wire from one end terminal of R1-A (red dot) fastens to the insulated stud on the modulator chassis; and the ground connection fastens to the grounded stud on the modulator chassis. Refer to the wiring diagram, Figure 35.

The bias supply and keyer unit should be installed in the left side of the cabinet on a level with the modulator chassis. Fasten it to the frame with four bolts from the hardware bag, and connect the cabinet cable to the terminal board, each wire to the lug for which it was obviously intended. Check each connection against the wiring diagram, Figure 35, and the wiring chart following the wiring diagram. Note: Terminals 9, 10, 11 and 12 will have no cable connection to them, only bus wire jumper connections.

d. Box 5.—

This box contains both the 1600/400 and 1500/350 volt power supplies.

The 1600/400 volt supply chassis can be recognized by the fact that each component symbol stamped on the chassis terminates with the letter "C". Insert this chassis through the rear of the cabinet to a position directly below the modulator chassis. Fasten it to the frame with four bolts from the hardware bag. Each wire of the cabinet cable should be connected to the terminal board lug for which it is obviously meant. Also connect a WH-RD-YL wire from the cabinet cable to terminal 10 on the side of the chassis. Check each connection against the wiring diagram, Figure 35, and the wiring chart following the wiring diagram.

The 1500/350 volt supply chassis can be identified by the letter "D" following each component symbol. Install this chassis in the left side of the cabinet opposite the 1600/400 volt supply. Procedure is the same except that a WH-RD-BL wire is connected to terminal 10 of this chassis. Refer to Figure 35.

e. Box 6.—

The heavy chassis belonging in the bottom of the cabinet and known as the "TRANSFORMER TRUCK" has been shipped in box 6. On it are mounted the auto transformer, the high voltage transformer and filter chokes, and the blower unit. Insertion and removal of this unit are facilitated by four rollers, on its under-side, which are designed to fit a track on the transmitter frame.

To install the unit, proceed as follows:

(1) Remove the two screws placed in their holes on the rear wall of this chassis.

(2) Remove the four-inch-wide strip from the bottom of the front panel.

(3) Roll in the chassis, auto transformer T3-A side first, being careful that the rollers do not slip off their track.

(4) Replace the front strip putting five screws into the transformer truck frame. Extra screws will be found in the hardware bag.

(5) Fasten the rear of the chassis by inserting the two screws removed in (1), through the clearance holes in the relay and fuse panel into tapped holes in the chassis.

Make the following electrical connections:

(1) Auto transformer connections are made with a cable fastened to the cabinet. Lay the end of this cable over the auto transformer and connect each wire under the terminal for which it is obviously intended. All of these wires are of the same color with two exceptions. The WH-OR-YL-GN wire goes to "COMMON," and the WH-YL-GN-BN wire goes to the "230 v" terminal. When connections are finished, the "115 v" terminal will have two connections to it, the others only one.

(2) Fan motor connections are made by a cable and plug fastened to the transmitter frame, into a socket on top of the fan housing.

(3) Plate transformers, T2-C and T2-D, on each side connect with the attached leads to terminals 12 and 13 on the chassis above them.

(4) A three-wire cable from terminals 11, 12, and 13 on fuse panel terminal board, and terminating in a 4-prong plug, is to be inserted in a socket at the rear of the fan motor housing.

(5) Each pair of high voltage chokes, X1-C, X2-C and X1-D, X2-D, is supplied with two leads which are connected to the chassis directly above, one lead to terminal 11, the small stand-off insulator under the bleeder resistors, R1-D and R1-C, and the other lead to terminal 10, the end of the bleeder resistor which has a connecting lug. Connect the two wires in each pair without crossing them.

Open one box of transmitter tubes and insert them in the proper sockets throughout the transmitter. Place in each R-F unit, the crystal whose nameplate frequency corresponds to the frequency to which the respective antenna is tuned. Be sure to remove masking tape from the small ceramic terminal block above the buffer coil L3-F in each r-f unit. The front panel of the cabinet may now be replaced; however the rear panel should be left off until the internal adjustments described in the next chapter have been made.

f. Box 7.—

This box contains the remote control unit, less tubes, and should be opened and set up near the transmitter while the preliminary adjustments described in the next chapter are made. Then it may be moved to its permanent location and mounted in position.

Plug microphone and key into their respective jacks and connect control wires to the terminal board. Connections are as follows:

Terminals	Use
1 & 2	Modulator telephone line; no polarity.
3 & 4	Tone keyer telephone line; no polarity.
5 & 7	Normally closed receiver disabling line.
6 & 7	Normally open receiver disabling line.
8	Auxiliary microphone push-to-talk switch connection.
9	Auxiliary microphone button connection.
10	Ground; return circuit for 8, 9, and 11.
11	Auxiliary key line connection.
12 & 13	115-volt connections; no polarity.

3. REPACKING.—

In case it becomes necessary to pack the transmitter for reshipment, the following packing instructions are to be followed. These instructions describe the manner in which the transmitter was originally packed and may also be helpful in facilitating unpacking.

Remove all tubes and crystals for separate packing.

Remove all chassis except the relay and fuse panel and pack in separate boxes.

Navy style resistors should be tied in their clips. Masking tape should be used to fasten down movable parts such as relay contact arms, leads and small parts as fuses, dial locks, etc., which might vibrate or work loose in transportation. If desired, the mercury plunger tube of relay K5-B may be removed for separate packing. It will be necessary to demount the relay to remove it.

Wrap the cabinet and each chassis, first with a waxed paper to protect the finish, then with a corrugated paper to give it a little padding, and then with waterproof paper. Then put it in its packing box from which one side has been removed. Make sure output terminals are well protected and the sides properly blocked so that meters, dials, switches, and terminals will not be damaged. When putting on the last side be careful not to damage the unit with nails.

The remote unit should be packed in a similar manner. Tubes, crystals, microphones and other accessories should be well padded and shipped in as many boxes as desirable to assure arrival at the destination in good condition.

C. ADJUSTMENT AND OPERATION

1. TRANSMITTER.—

a. Preliminary Checks.—

Before finally mounting the rear panel on the cabinets, the initial adjustments described below must be made. In addition, certain checks should be made to see that the transmitter is ready for operation.

(1) See that all tubes are in their proper positions and pushed well down in their sockets.

(2) See that the rating marked on each fuse corresponds to that given in Table 3, and that each fuse is making firm contact at both ends.

(3) Re-check to be sure that the input power and control wires connect to the proper terminals.

(4) See that the fan motor oil cups are nearly full of light machine oil.

(5) Check to be sure that all links and coil taps are correct for the assigned output frequency.

While making adjustments or tuning the transmitter with front and rear panels removed, it will be necessary either to temporarily jumper both interlock switches or use a "C" clamp to hold them closed.

The range of frequencies, 1500 to 7000 kc, covered by this equipment has been subdivided into four bands as follows:

Band A, 1500 to 2000 kc
Band B, 2000 to 3500 kc
Band C, 3500 to 5000 kc
Band D, 5000 to 7000 kc

This division is an arbitrary one and rigid adherence to it is not necessary. In actual practice there is a little overlap between bands. When operating on a frequency near the band limit it may be found that changing to the next band will give better results. It is even permissible to operate with one stage set for one band and the next stage for a different band. Refer to the tuning charts in the appendix of this book.

Oscillator.—

This stage has no links or coil taps. Its frequency range is 1500 to 3500 kc. Cover bands C and D by tuning the buffer-doubler and power amplifier stages to the second harmonic of the crystal frequency.

Buffer-Doubler.—

Change bands by connecting the flexible shorting lead on each end of the coil to the nearby terminal bearing the letter designation of the desired band.

Power Amplifier.—

Change bands as for the Buffer-Doubler except that the links connecting C15-F to C19-F and C16-F to C20-F, found under the top deck of the r-f unit, should be closed for band A but open for the other three bands.

b. Initial Adjustments.—

(1) Rectifier Tap Switch.—

The rectifier power supply tap switch S2-B is mounted on a bracket from tranformer T1-B on the relay panel at the lower rear of the cabinet. It has 5 positions which select various voltage taps on transformer T1-B. Its purpose is to allow selection of the proper relay operating voltage. Since the relay power supply furnishes voltage used over the telephone lines to the remote unit, more

voltage is required when operating over long lines than over short ones. However, the adjustment is not critical, the general rules being as follows:

Tap 1, OFF position.
Tap 2, for local operation or when remote unit is in same building.
Tap 3, for lines up to 3 miles long.
Tap 4, for lines 3 to 7 miles long.
Tap 5, for lines 7 to 10 miles long.

For temporary operation or for test keying at the local point, the voltage need not be reduced when switching from remote to local. However, for extended periods of operation at the local point, the switch should be in number 2 position, so as to avoid undue heating of relay coils.

(2) Modulator, Keyer, and Remote Adjustments.—

This section describes the procedure for making the semi-permanent adjustments of the "DB," "COMP," and "GAIN" controls on the modulator chassis, the "GAIN" control on the keyer chassis, and the "TONE LEVEL" and "MCW LEVEL" controls on the remote unit chassis.

CAUTION: Do not attempt to change the position of the adjusting knobs on the modulator chassis while the transmitter is operating. Before reaching inside the transmitter, rotate the "PLATE" tap switch to "OFF." When following the step by step adjustment procedure described in the following paragraphs, use the trial and error method; that is, move the desired knob a little at a time, turning off the plate voltage each time before changing the knob setting.

Before attempting adjustments in this section, rotate "DB," "COMP" and "GAIN" controls on the modulator chassis to the extreme counter-clockwise positions.

Set up the remote control unit adjacent to the transmitter. Connect terminals 1, 2, 3, 4, and 10 of the remote unit to terminals 4, 6, 1, 3 and 10 respectively of the telephone terminal board, located on the left side of the relay and fuse chassis at the transmitter. Connect terminals 12 and 13 of the remote unit to the 115-volt power line.

Tune the transmitter to full r-f power output on either channel CW, following the instructions given under "TUNING PROCEDURE." Set the transmitter "SELECTOR" switch in the center or "REMOTE" position.

Turn on the remote unit and set its "SELECTOR" switch for MCW on the same channel tuned in the last paragraph. Set the "TONE LEVEL" adjusting knob to 17. Hold down the hand key and set the "MCW LEVEL" adjusting knob so the db meter reads zero level.

Hold down the key at the remote unit while making the following adjustments at the transmitter on the keyer unit and the modulator unit. Starting with the "GAIN" control on the keyer in the extreme counter-clockwise position, rotate the control clockwise until the transmitter "keys," that is, delivers full power output. This knob should be kept at the minimum setting consistent with good keying. Proper adjustment for short control lines should occur at approximately 20 on the dial.

The "DB," "COMP," and "GAIN" controls on the modulator chassis of the transmitter should be adjusted as follows:

(a) Rotate the "DB" and "COMP" controls to their minimum or extreme counter-clockwise position.

(b) Set the transmitter panel "ATTENUATOR" to 25.

(c) Adjust the "GAIN" control to 100 per cent modulation. An oscilloscope may be used or an approximation may be made by setting the "GAIN" for 275 ma modulator plate current at 300 watts r-f output. The control setting will be approximately 35.

(d) Adjust the "DB" control so the db meter reads zero level. Setting should be approximately 95.

(e) Turn the "COMP" control clockwise to 65.

(f) Rotate the panel "ATTENUATOR" to 35.

(g) Re-adjust the "GAIN" control until the db meter reads —3.

(h) Adjust the "COMP" control until changing the "ATTENUATOR" from 35 to 25 causes the db meter to rise from —3 to 0 db.

When all adjustments have been made and remote control unit operation is satisfactory, the remote unit may be disconnected and moved to the desired operating position. Intervening telephone lines must interconnect the same terminals as previously described, except terminal 10 on transmitter and remote unit. These terminals may be connected together with a fifth wire or may each be connected to a good earth ground. NOTE: It is essential for the operation of the simplex circuits that the intervening telephone circuits provide a d-c path. The presence of repeaters or line transformers will prevent the control circuits from functioning.

After final installation of the remote unit, it may be necessary to readjust the "GAIN" control on the keyer and the panel "ATTENUATOR" at the transmitter to compensate for loss in the telephone control circuits.

Rotate the keyer "GAIN" control clockwise until the transmitter will again respond to keying from the remote unit.

While operating on MCW at zero level, re-set the transmitter panel "ATTENUATOR" so that the DB meter also reads zero. The new setting should be recorded and the "ATTENUATOR" always left there for remote operation. If the remote unit is moved to a new location it will be necessary to make these last two adjustments again. The others, previously described, are permanent.

(3) Cabinet Thermostat.—

The accuracy of this instrument has been checked at the transmitter factory, and necessary internal adjustments have been made. The only adjustment to be made in the field is to set the external temperature dial to "53."

c. Tuning Procedure.—

Before closing the main line switch, see that the "LINE" and "PLATE" tap switches are rotated to the "OFF" or extreme counter-clockwise position, the "ATTENUATOR" control set to maximum attenuation, the test key in neutral position, and the "SELECTOR" switch in CW channel 1 or channel 2 position. Make sure the transmitter is connected to a dummy antenna or load. Always set all tuning dials of the r-f unit at 100 before attempting to tune the transmitter.

Close the main line switch on the rear of the transmitter cabinet. Rotate the "LINE" tap switch clockwise until the line voltmeter indicates 115 volts. The green "FILAMENT" indicator lamp and the white channel indicator lamp corresponding to the channel selected should light and the blower start. In approximately 35 seconds the time relay K5-B will close.

Rotate the "PLATE" tap switch clockwise to POSITION ONE. The red "PLATE" indicator lamp will light, and the power amplifier plate meter will indicate voltage. The buffer-multiplier, power amplifier, and antenna current meters should be dead but the oscillator meter should have a small reading.

Move the lever of test switch S1-A (test key) to the upward position. Tune each stage as follows:

Tune the oscillator dial to maximum buffer-doubler plate current setting, which is approximately coincident with minimum oscillator plate current.

Tune the buffer-doubler dial for maximum power amplifier plate current which in turn occurs at practically the same setting as minimum buffer-doubler plate current.

Tune the power amplifier dial for resonance as indicated by minimum plate current of that stage.

Rotate the "PLATE" tap switch clockwise until the power amplifier plate voltage is 1650 volts.

Normal antenna current for 300 watts output into a 600 ohm load is 0.707 ampere. Adjust the antenna loading dial to increase output current to this value. After each change in the loading dial, the power amplifier must be returned to resonance.

Move the test key up and down several times to be sure the transmitter is keying properly, that is, that the meters with the exception of the oscillator plate meter, drop to zero when the key is in neutral position and return to their normal position when the key is in "KEY DOWN" position.

Make the initial adjustments described in Section C-1-b.

Set the "SELECTOR" switch for phone operation on the same channel. The carrier now must be controlled with the push-to-talk switch on the microphone.

Plug in a test microphone and hold in the microphone control switch. Slowly rotate the attenuator toward zero while talking into the microphone. If the speech amplifier and modulator knob adjustments have been properly made, 100 per cent modulation is reached when the db meter deflects upward to zero level.

2. REMOTE CONTROL UNIT.—

a. Preliminary Checks.—

After mounting this unit in its rack, and while the dust cover is removed, make the following checks:

(1) See that the tubes are in their proper positions and pushed well down in their sockets.
(2) Remove the fuse from the extractor fuse post and make sure that it has a 1.5 ampere rating.
(3) Recheck to see that terminal board connections have been made properly.

b. Initial Adjustments.—

For adjustment of the "TONE LEVEL" and "MCW LEVEL" controls, refer to "TRANSMITTER Initial Adjustments," Section C-1-b-(2).

The "CONT. VOLTS" switch S4 should be adjusted to the same setting as the corresponding switch on the relay and fuse panel of the transmitter. Refer back to Section C-1-b-(1) of this chapter.

c. Operating Procedure.—

Before the remote control unit can function, certain controls at the transmitter must be set as follows:

(1) "ATTENUATOR" set on remote operating position as determined by Section C-1-b-(2)-(h), last paragraph.
(2) Set the "SELECTOR" in the center (off) position.
(3) "SELECTOR" set on "REMOTE" (center) position.
(4) Main line switch on rear of transmitter closed.
(5) R-F tuning controls properly adjusted, refer to C-1-c.

When the control unit has been installed and the transmitter controls correctly set, the steps recommended for operating the unit are:

(1) Connect a telegraph key or microphone to either the control jacks or terminal board connections.
(2) Set the "SELECTOR" in the center (off) position.
(3) Turn on line switch S1 (Power Off) and allow 15 to 30 seconds for tube filament to heat.
(4) Check to make sure telegraph key or microphone push-to-talk switch is open.
(5) Rotate "SELECTOR" switch to desired operating position.
(6) Allow at least 35 seconds for transmitter filaments to heat and time delay relay K5-B to close. The transmitter is now ready to be controlled by keying or with microphone and its push-to-talk control, whichever type of operation has been selected.
(7) If voice operation is intended, adjust "ATTENUATOR" to such a position that on voice peaks, the db meter reaches zero level.

NOTE: Operation of transmitter must be ascertained by picking up the signal on a receiver or monitoring device.

D. MAINTENANCE AND REPAIR

1. INSPECTIONS.—

a. Periodic Inspections.—

A careful inspection of the transmitter should be made at least once a week, preferably immediately following a continuous run of at least four hours.

All meter readings should be recorded. A comparison of these readings will show any sudden or gradual change in tube or operating conditions. A decrease in the reading of a plate milliameter may indicate loss of emission in a tube filament. Tubes showing signs of failure should be replaced at once.

Indicator lamps should be examined and replaced if burned out.

Upon shutting down after a long period of continuous operation, the front and rear panels should be removed for a careful examination of all components. This includes touching the transformers carefully for signs of excessive heating.

The two oil cups mounted one on each end of the fan motor, should be filled with light machine oil. (SAE No. 20.)

b. Bi-monthly Inspections.—

Every two months, the regular periodic inspection should be more thorough and, in addition to the items listed in the last section, it should include:

(1) Examination of relays and contactors for contact pitting and tightness. The armature of each should be operated by hand to make sure it moves freely. Any irregularities of the contact surfaces should be removed with a burnisher or with crocus cloth. DO NOT USE EMERY CLOTH OR SANDPAPER. Clean the contacts with alcohol, carbon tetrachloride, or ethyl acetate.

(2) Inspection of the contacts of the "ATTENUATOR."

If they are dirty, they should be cleaned with carbon tetrachloride, and a thin film of high grade clock oil or vaseline applied to minimize wear. Be sure that the dust cover is always replaced to keep dust and grit off the contacts and out of the resistors.

(3) Inspection and cleaning of the "SELECTOR" switch contacts with carbon tetrachloride.

(4) Inspection and servicing of the main line switch S1-B.—

(a) Renewal of Contacts.—

DO NOT FILE OR DRESS THE SILVER CONTACTS IN ANY WAY. When any of the contacts have become worn or burned below the silver face of the contact, the complete set of contacts should be renewed as follows:

Disconnect the starter from the line by means of the service knife switch. In order to renew the stationary contact plates (Part No. 4227-37, see page 70) remove the complete switch base from the case after which the contact plates can easily be removed. To renew the movable contacts (Part No. 4221-5, see page 70) unscrew the two hexagon head posts which will permit the removal of the contact board assembly (Part No. 81-209-3, see page 70). Before putting the starter back in operation care should be taken that all parts are in their proper places and all screws are tight.

Be sure that the stationary contacts and the movable contacts make good contact, and that the screws, etc., are tight.

(b) Replacement of Heater Coil.—

Remove the four terminal nuts at the bottom of the starter. Insert the heater coils. Be sure that the asbestos tube surrounds the coils and that the heater coils are not bent out of shape. The coils should fit down well into lower part of holes and the heater coil eyes should fit over the terminal studs. Replace the terminal nuts.

(5) Dusting and cleaning the transmitter.

Dust the outside surfaces with a dry cloth. If it is necessary to remove grease spots or finger marks, a small quantity of carbon tetrachloride on a clean cloth should be used. Do not use

alcohol, soap, or scouring powder. Clean the inside of the cabinet to remove any dust which may have accumulated. Dust in corners should be blown out while that on accessible surfaces should be carefully wiped off. Care should be taken while cleaning not to damage tubes, insulators, or other easily breakable parts.

(6) Inspection of the spun glass air filters.

Remove large accumulated particles such as insects, paper, etc. When air passage through it appears to be materially restricted by dust, replace the filter with a new one.

c. Adjustments.—

Every six months, the small-knob adjustments on both transmitter and remote control unit should be checked as described under the chapter "ADJUSTMENT AND OPERATION." If, at any time, there is reason to suspect these adjustments have changed, they should be checked without waiting for the regular inspection period.

d. Care of the Remote Unit.—

This unit requires little attention. Every two months the "SELECTOR" switch and "ATTENUATOR" control should be serviced as described for the corresponding units on the transmitter. Cleaning procedure is the same for both units.

e. Table of Routine Inspection and Service.—

(1) Weekly.—
Record all meter readings.
Check Indicator lamps.
Check for signs of overheating.
Oil the fan motor.

(2) Every Two Months.—
Examine relays and contactors for tightness.
Clean relay and contactor points.
Clean "SELECTOR" switch.
Service main line switch.
Clean transmitter.
Inspect filter and replace when necessary.
Service "SELECTOR" and "ATTENUATOR" on remote unit.
Clean remote unit.

(3) Every Six Months.—
Check small-knob adjustments on transmitter and remote unit.

2. SERVICING.—

a. Interpreting Connection Diagrams.—

All connection diagrams in this book use the "HIGHWAY" system of wiring. This system reduces confusion by reducing the number of lines running across the drawing. Individual wires are grouped together into a highway which resembles the actual wiring cable in the chassis as to shape, routing and wire content. As individual wires in the diagram leave the highway or cable to connect to terminals, each wire is marked with an appropriate designation. The designation contains two groups of letters or numerals separated by a comma or a hyphen. The first group indicates the termination of the wire at the opposite end. The second group is the cable wire number. The wire number is the cross reference number to the wiring chart found on the page following each connection diagram.

For example, refer to Figure 32, Bias Supply and Keyer connection diagram. The wire on the CT terminal of T4G bears the legend, "C2G,18". This indicates the opposite end of the wire will be found on capacitor C2G, and that the wire number is 18. Examine C2G to find wire 18 on the

ungrounded terminal and bearing the legend, "T4G, 18." Reference to the wiring chart on the page following Figure 32 shows that wire 18 is a WHITE-ORANGE-GREEN wire, size 20, with 1000-volt insulation.

All connection diagrams are laid out with components drawn to resemble physically the actual parts and placed in approximately the same positions as the parts are mounted in the actual chassis.

b. General Information.—

In the event of break-down of the station, the tests described in this section should be made and the defective part replaced or repaired at the transmitting station. However, should it be impossible to remedy the difficulty in the field, the transmitter should be repacked according to the instructions given in the chapter "INSTRUCTIONS FOR INSTALLATION," and shipped to the nearest U. S. Army repair station. The information given here should enable all but the most severe difficulties to be detected at the transmitting location.

c. Equipment Required.—

It is recommended that the following equipment be kept on hand at the transmitter.

(1) A small portable test set capable of reading d-c voltages up to 2500, d-c currents up to 500 ma, a-c voltages up to 2500, and resistances as low as 25 ohms. Recommended types are Supreme model 543, or Triplett model 666-H.

(3) A kit of tools including a 75-watt soldering iron, large, medium and midget screw-drivers, pliers, a set of small end-wrenches and numbers 6, 8, and 10 Allen wrenches.

(3) A fuse tester made by soldering two stiff insulated leads, 3 inches long, to the two contacts of a quarter-watt neon bulb. This item is handy for testing the fuses on the fuse panel without removing them from their clips. To use it, leave power applied to all circuits of the transmitter, and touch the bare ends of the insulated wires to each fuse in turn, in such a manner that the neon bulb will be parallelled with the fuse. An open fuse will cause the neon bulb to glow.

(4) A tube filament emission tester capable of accommodating all tubes used in the transmitter.

(5) A small oil can and a supply of SAE No. 20 motor oil for blower motor.

d. Methods of Testing Components.—

(1) Fuses.—

Test with the above described tester. Should a fuse fail repeatedly without apparent cause, check the fuse rating against that given in Table 3. In the absence of the special fuse tester an ohmmeter may be used if the fuse is removed from its clips. All fuses should measure less than 25 ohms.

(2) Capacitors.—

A capacitor should always have at least one of its terminals disconnected from the circuit while being tested. Those which have broken down to provide a moderately low resistance or dead short circuit can readily be detected with an ohmmeter. Intermittent capacitor failures can often be detected by connecting a high range voltmeter in series with the capacitor and applying a suitable voltage, not to exceed the working voltage rating. If the voltmeter deflection does not return to zero, the capacitor is defective. Other checks of capacitor operation are difficult with field equipment and it is often advisable to substitute a new capacitor for one that is of doubtful efficiency.

(3) Inductors.—

Trouble in a tuning coil is generally due either to an open circuit or to insulation break-down between turns. A careful visual inspection will often reveal it. An ohmmeter may be used to detect an open circuit in a choke or tuning coil or a short circuit in a choke coil if it is sensitive enough to indicate a resistance of only a few ohms. If the inductor is connected in a circuit

which provides a d-c shunt path around it, the inductor must have at least one terminal disconnected if a true indication is to be obtained.

(4) Resistors.—

The resistance of a resistor may be checked with an ohmmeter and compared with the value given in the parts list. It is advisable always to disconnect a resistor from the rest of the circuit while measuring its resistance, as it may have shunt paths around it which are easily overlooked, but which affect the accuracy of the measurement.

(5) Transformers.—

Each winding of a power transformer may be tested for voltage and the values compared with those given in the parts list. The values given are for normal load conditions. Audio transformer windings may be tested with an ohmmeter to detect open or short circuits.

(6) R-F Circuits.—

Care should be used when measuring plate and grid voltages on the r-f unit. Unless the test meter is suitably by-passed to prevent r-f current from entering and damaging it, always measure d-c voltages at a point of zero r-f potential; that is, at the cold point on the coil rather than directly on the plate or grid of the tube.

e. Recommended Checking Procedure.—

(1) In event of transmitter failure or abnormal operation, make the following external mechanical and visual inspections:

(a) Make certain there has not been a power line failure.

(b) Check to see whether any external connections (including antenna transmission lines) have become loosened or disconnected.

(c) Compare meter readings, if any, with those taken during the previous inspection period.

(d) Try operating on the other channel and with various types of emission.

(2) If these tests do not indicate the trouble, or if further checking must be done, remove the rear panel, jumper the interlock switch and:

(a) Check all fuses with the fuse tester.

(b) Be sure all tubes are pushed well down in their sockets.

(c) Observe that all glass-type tubes are lighted, and touch all metal-type tubes cautiously to see whether they are warm.

(d) Test all tubes suspected to be at fault or replace with ones known to be good.

(e) Make sure that r-f coil taps and the power amplifier link connection (if used) have not become loosened.

(f) Be sure all terminal board connections are made and are tight.

(g) Examine contactors and relays to see that each armature is free to move.

(h) Touch all components cautiously (after power has been turned off) to detect signs of overheating.

(3) The next series of tests should be to check terminal board voltages beginning with the suspected chassis. For convenience, a tabulation of terminal board voltages is given. Where maximum and minimum voltages are given the readings are dependent upon the setting of switch S6A.

(a) R. F. Unit.—

Terminal 1 to chassis.—P.A. plate, 1600 v to 2200 v d-c.
Terminal 2 to chassis.—P.A. screen, 380 v to 430 v d-c.
Terminal 3 to chassis.—Osc. & Buffer plate, 380 v to 430 v d-c.
Terminal 4 to chassis.—P.A. fil. C.T., 0.
Terminal 5 to chassis.—P.A. grid, —100 v key up to —160 v d-c key down.

Terminal 6 to chassis.—Buffer Cathode, 0.
Terminal 7 to chassis.—Buffer grid, —100 v to —160 v d-c.
Terminal 8 to chassis.—Osc. Cathode, 0.
Terminal 9 to chassis.—Osc. suppressor key, up —190 v d-c, key down 0 to —20 v d-c.
Terminals 10 to 11, Fil. Trans. pri., 115 v a-c.
Terminal 12, ground.

(b) Speech Amplifier and Modulator.—

Terminal 1 to chassis.—Mod. plate, 1500 v to 2000 v d-c.
Terminal 2 to 3.—Fil. trans. pri., 115 v a-c.
Terminal 4 to chassis.—Speech amp. plates, 350 v to 400 v d-c.
Terminal 5 to chassis.—P.A. screen, 380 v to 430 v d-c.
Terminal 6 to chassis.—Mod. grid, —11 v d-c.
Terminal 7 to chassis.—Mod. fil., C.T. 0 when relay K-9B is closed, 40 v d-c when relay K-9B is open.
Terminal 8, ground.
Terminals 9 and 10.—DB meter line, 0 d-c.
Terminal 11 to chassis.—P.A. plate, 1600 v to 2200 v d-c.

(c) Bias Supply and Keyer Unit.—

Terminal 1 to chassis.—Microphone supply, —3 v d-c.
Terminal 2 to chassis.—Buffer grid, —100 v d-c.
Terminal 3 to chassis.—P.A. grid, —100 v d-c.
Terminal 4 to chassis.—Osc. sup., —190 v d-c approx., key up, 0 to —20 v d-c key down.
Terminal 5, 6, and 7, telephone line input.
Terminal 8 to chassis.—Keyer amp. plates 380 v to 430 v d-c.
Terminal 9 and 10.—Bias fil. trans., 115 v a-c.
Terminal 11 and 12.—Bias plate trans., 115 v a-c.
Terminal 13 and 14.—Keyer fil. trans. 115 v a-c.
Terminal 15, Ground.

(d) 1600/400-volt Power Supply.—

Terminal 1 to chassis.—1360 v to 2140 v d-c key up, 1250 v to 1940 v d-c key down.
Terminal 2 to chassis.—320 v to 500 v d-c key up, 290 v to 430 v d-c key down.
Terminals 3 and 4.—H.V. fil. trans., 115 v a-c.
Terminals 5 and 6.—L.V. plate trans., 115 v a-c.
Terminals 7 and 8.—L.V. fil. trans., 115 v a-c.
Terminal 9, ground.
Terminal 10 to chassis.—0 key up, 10 v d-c key down.
Terminal 11 to chassis.—1360 v to 2140 v d-c key up, 1250 v to 1940 v d-c key down.
Terminal 12 to terminal 13.—3800 v a-c.

(e) 1500/350-Volt Power Supply.—

Terminal 1, ground.
Terminals 2 and 3.—L.V. fil. trans., 115 v a-c.
Terminals 4 and 5.—L.V. plate trans., 115 v a-c.
Terminals 6 and 7.—H.V. fil. trans., 115 v a-c.
Terminal 8 to chassis.—320 v to 500 v.
Terminal 9 to chassis.—1290 v to 2000 v d-c key up, 1280 v to 1980 v d-c key down.
Terminal 10 to chassis.—0 to 2 v d-c.
Terminal 11 to chassis.—1500 v to 1900 v d-c.
Terminal 12 to terminal 13.—3600 v a-c.

f. Chassis Removal.—

CAUTION—Although it is possible to check some tube voltages, using test prods, without removing the chassis, *the high voltages employed in this transmitter make this method a dangerous one.* It is recommended that, if the fault can be isolated to an individual chassis, that chassis be removed and the wiring and parts checked with an ohmmeter. The wiring diagrams in this book will be found useful.

The following instructions are for the removal of chassis:

(1) R.F. Unit.—

Disconnect the terminal board wires.

With a screw-driver, remove the screws on the two square post insulators which are mounted on coils L4-F and L5-F and slip out the antenna and r-f ammeter connections.

Remove the four screws holding the chassis down on the frame.

Take unit out through rear of cabinet.

(2) Speech Amplifier and Modulator.—

Disconnect terminal board wires.

Slip off the three friction clips on the front of the chassis, one from the VT-86 grid cap, one from an insulator on the chassis, and the last from a ground stud on the chassis.

Slip the two cable cap leads off the modulation transformer.

Remove the four screws holding the chassis to the frame.

Take the unit out through the rear of the cabinet.

(4) Power Supply Chassis.—

Disconnect the rear terminal board wires.

Disconnect the five wires from the terminals on the side of the chassis.

Remove the four screws holding the chassis on the frame.

Take each chassis out through the rear of the cabinet.

(5) Transformer Truck.—

Refer to the "INSTRUCTIONS FOR INSTALLATION." The unit comes out just as it was installed.

APPENDIX

Table 1

TUBE OPERATING VOLTAGES

Symbol	Type	Application	Fil. (a-c)	Plate (d-c)	Grid (d-c)	Screen (d-c)
VT1-C	VT-46-A	H. V. Rectifier	2.5	.....	.....	.....
VT2-C	VT-46-A	H. V. Rectifier	2.5	.....	.....	.....
VT3-C	VT-145	L. V. Rectifier	5.0	.....	.....	.....
VT1-D	VT-46-A	H. V. Rectifier	2.5	.....	.....	.....
VT2-D	VT-46-A	H. V. Rectifier	2.5	.....	.....	.....
VT3-D	VT-145	L. V. Rectifier	5.0	.....	.....	.....
VT1-E	VT-86	1st Audio	6.3	65	.....	.....
VT2-E	VT-65	2nd Audio	6.3	280	–9	.....
VT3-E	VT-95	Driver	2.5	375	–60	.....
VT4-E	VT-95	Driver	2.5	375	–60	.....
VT5-E	VT-143	Modulator	10.5	1500	–12	.....
VT6-E	VT-143	Modulator	10.5	1500	–12	.....
VT7-E	VT-88	Compressor	6.3	250	–7	.....
VT1-F*	VT-101	Oscillator	12.6	400	–25	175
VT2-F	VT-100	Buffer-Doubler	6.3	400	–90	175
VT3-F	VT-144	Power Amplifier	10.0	1600	–90	400
VT4-F	VT-144	Power Amplifier	10.0	1600	–90	400
VT1-G	VT-65	Tone Amplifier	6.3	140	–4.5	.....
VT2-G	VT-66	Tone Amplifier	6.3	260	–18	270
VT3-G	VT-145	Tone Rectifier	5.0	.....	.....	.....
VT4-G	VT-65	Tone Keyer	6.3	.....	.....	.....
VT5-G	VT-145	Bias Rectifier	5.0	.....	.....	.....
VT-1	VT-145	Rectifier	5.0	.....	.....	.....
VT-2	VT-65	Amplifier	6.3	250	–8	.....
VT-3	VT-99	Tone Osc.-amp.	6.3	250	.....	.....

*Suppressor, –250v, key up

Table 2

TUBE OPERATING CURRENT

Symbol	Type	Application	Fil. (a-c) a.	Plate (d-c) ma.	Grid (d-c) ma.	Screen (d-c) ma.
VT1-C	VT-46-A	H. V. Rectifier	5.0	130	.....	.....
VT2-C	VT-46-A	H. V. Rectifier	5.0	130	.....	.....
VT3-C	VT-145	L. V. Rectifier	3.0	115	.....	.....
VT1-D	VT-46-A	H. V. Rectifier	5.0	150	.....	.....
VT2-D	VT-46-A	H. V. Rectifier	5.0	150	.....	.....
VT3-D	VT-145	L. V. Rectifier	3.0	162	.....	.....
VT1-E	VT-86	1st Audio	0.3	5	.....	.....
VT2-E	VT-65	2nd Audio	0.3	7	.....	.....
VT3-E	VT-95	Driver	2.5	60	.....	.....
VT4-E	VT-95	Driver	2.5	60	.....	.....
VT5-E	VT-143	Modulator	3.25	105	.....	.....
VT6-E	VT-143	Modulator	3.25	105	.....	.....
VT7-E	VT-88	Compressor	0.3	7	.....	.....
VT1-F	VT-101	Oscillator	0.7	25	.....	10
VT2-F	VT-100	Buffer	0.9	35	5	2
VT3-F	VT-144	Power Amplifier	5.0	130	16	20
VT4-F	VT-144	Power Amplifier	5.0	130	16	20
VT1-G	VT-65	Tone Amplifier	0.3	4	.....	.....
VT2-G	VT-66	Tone Amplifier	0.7	30	.....	10
VT3-G	VT-145	Tone Rectifier	3.0	10	.....	.....
VT4-G	VT-65	Keyer	0.3	2	.....	.....
VT5-G	VT-145	Bias Rectifier	3.0	31	.....	.....
VT-1	VT-145	Rectifier	3.0	38	.....	.....
VT-2	VT-65	Amplifier	0.3	4	.....	.....
VT-3	VT-99	Tone Osc.-amp.	0.6	12	.....	.....

Table 3

FUSE RATINGS AND OPERATING CURRENTS

Symbol	Rating (Amps)	Oper. Current (Amps)	Symbol	Rating (Amps)	Oper. Current (Amps)
F1-B	15	8.0	F9-B	1	0.30
F2-B	30	19.	F10-B	1	0.35
F3-B	2	1.6	F11-B	2	0.9
F4-B	2	2.25	F12-B	2	1.2
F5-B	15	3.7	F13-B	2	1.2
F6-B	20	6.2		Remote Control Unit	
F7-B	1	0.8	F1	1.5	0.5
F8-B	1	0.35			

Table 4

PARTS LIST SYMBOLS

These symbols have been selected for use in the parts lists, schematic and wiring diagrams of this equipment as representing the best engineering practice.

Symbol	Part	Symbol	Part
A	Miscellaneous Items	M	Meter
C	Capacitor	R	Resistor
F	Fuse	S	Switch
I	Indicator Lamp	T	Transformer
J	Jack	V	Tube Socket
K	Relay or Contactor	VT	Vacuum Tube
L	Inductance	X	Choke

TABLE OF REPLACEABLE PARTS
CABINET

Symbol	Name or Function	Description	Mfr.	Mfr. Identification	AIRACO Part No.	Notes
C1-A	Capacitor, Osc. Meter By-Pass	.006 mfd. ±10%; 600 v	AX	1650LST	L61000-22LST	
C2-A	Capacitor, Buffer Meter By-Pass	Same as C1-A				
C3-A	Capacitor, P. A. Meter By-Pass	Same as C1-A				
C4-A	Capacitor, Mod. Meter By-Pass	Same as C1-A				
C5-A	Capacitor, H. V. Meter By-Pass	Same as C1-A				
R1-A	Resistor, Mod. Volume Control	250,000 Ohms; Variable	IRC	A-21	A61375-1	
R4-A	Resistor, Static Drain	500,000 Ohms ±10%; 2 w	IRC	BT-2	A61336-190	
R5-A	Resistor, Static Drain	Same as R2-A				
M1-A	Meter, Osc. Plate Current	0-100 ma; Rect. Face	WN	Model 301	L61411-162	
M2-A	Meter, Buffer Plate Current	Same as M1-A				
M3-A	Meter, P. A. Plate Current	0-800 ma; Rect. Face	WN	Model 301	L61411-168	
M4-A	Meter, High Voltage	0-2.5 kv Scale, 0-1 ma Movement; Rect. Face	WN	Model 301	L61411-176	
M5-A	Meter, R-F Output Current	0-1 a; Rectangular Face	WN	Model 425	L61415-121	
M6-A	Meter, R-F Output Current	Same as M5-A				
M7-A	Meter, Mod. Plate Current	Same as M3-A				
M8-A	Meter, Audio Level	-10/0/+6 db; Rect. Face	WN	Model 301	L61417-1	
M9-A	Meter, Line Voltage	0-130 v a-c Rect. Face	WN	Model 476	L61416-63	
		or 0-150 v a-c; Rect. Face	WN	Model 476	L61416-64	
T1-A	Transformer, Mod. Input	600-ohm Line-to-Grid	TH	T45127	L20674-1	
T2-A	Transformer, Microphone	S. B. Mic. to 600-ohm Line	TH	T44936	L20667-1	
T3-A	Transformer, Auto	2500 va; Pri: 230 v; Sec: Tapped in 5 v Steps from 80 to 125 v	TH	T44825	L20670-1	
T4-A	Transformer, Constant Voltage	500 va; Pri: 95 to 125 v; Sec: 115 v	S or TH	3004 or T46927	A10975-1 L20702-1	
S1-A	Switch, Lever Type Test Key	SPDT; Lock and Non-Lock	KE	E. S. 3203	A62025-1	
S2-A	Switch, Local-Remote	3 Wafer Rotary; 7 Pole, 5 Position	OAK	*	A10968-1	
S4-A	Switch, Interlock	SPST, N. O.; Push Type	H&H	3592	A62015-1	
S6-A	Switch, Plate Voltage Tap	115 v, 15 a; 12 Position	OM	Model 312	L62023-1	
S7-A	Switch, Line Voltage Tap	Same as S6-A				
J1-A	Jack, Microphone	Three Circuit Type	WE	246-E	A62509-3	
I1-A	Receptacle, Fil. Indicator Lamp	Green Disc; 110 v Candelabra	DI	100D	A65501-2	
I2-A	Receptacle, H. V. Indicator Lamp	Red Disc; 110 v Candelabra	DI	100D	A65501-1	
I3-A	Recep., R-F No. 1 Indicator Lamp	Opal Disc; 110 v Candelabra	DI	100D	A65501-6	

*Mfd. by AIRACO Drawing A10968-1

TABLE OF REPLACEABLE PARTS

CABINET (Cont'd)

Symbol	Name or Function	Description	Mfr.	Mfr. Identification	AIRACO Part No.	Notes
I4-A	Recep., R-F No. 2 Indicator Lamp	Same as I3-A				
L1-A	Choke, Static Drain	2.5 mh, 500 ma	AIR-		A10124-504	
L2-A	Choke, Static Drain	Same as L1-A	ACO			
L3-A	Choke, Static Drain	Same as L1-A				
L4-A	Choke, Static Drain	Same as L1-A				
A1-A	Blower Motor	110 v, 60 cy. 1/25 hp	FAS	E6H1A	L20159-1	
	Blower Blade	10″ Blade as Used on V-510 Vent Fan Except with 5/16″ Bore	SI		L20157-1	
A2-A	Thermostat, Cabinet	220 v; Circuit Opening	PE	Type 874A01 Model 1005	L62300-1	
A3-A	Meter Multiplier	2.5 megs ±2%	SE	Model 25	A61405-8	
	Indicator Lamps Used in All Receptacles	115 v; 6 w; Mazda	GE	S6	A65101-1	

RELAY AND FUSE PANEL

C1-B	Capacitor, Relay Supply Filter	8 mfd, ±10%; 600 v	AX	26911-2	A10942	
R1-B	Resistor, Modulator Bias	50 ohms ±5%; Style E	OM	Special	A61300-18	
R2-B	Resistor, Modulator Bias	25,000 ohms ±10%; 1 w	IRC	BT-1	L61333-152	
R3-B	Resistor, Overload Heater	30 a	CH	H324	L62021-3	
R4-B	Resistor, Overload Heater	18 a	CH	H173	L62021-2	
T1-B	Transformer, Relay Supply	Pri: 115 v; Sec: 105/90/75/60 v @ 100 ma	TH	T45332	L20665-1	
S1-B	Switch, Main Line	A-C Manual Starter	CH	9115H45B	L62021-1	
S2-B	Switch, Relay Supply Tap	1 wafer; SP5T Non-shorting	MY	3215J	A62024-1	
S3-B	Switch, Interlock	Same as S4-A				
K1-B	Relay, No. 1 Channel Control	SPDT; DPST, N. O. Contacts 40 v d-c Coil	AD	Series 975B-3B	A62215-1	
K2-B	Relay, No. 2 Channel Control	Same as K1-B				

TABLE OF REPLACEABLE PARTS

RELAY AND FUSE PANEL (Cont.)

Symbol	Name or Function	Description	Mfr.	Mfr. Identification	AIRACO Part No.	Notes
K3-B	Relay, Mod. Fil. Control	SPST, N. O. Contacts; 40 v d-c Coil	AD	Series 951B	A62216-1	
K4-B	Contactor, Filament	115 v, 20 a, DPST, N. O. Contacts; 115 v a-c Coil	AB	A209	L62202-3	
K5-B	Relay, Time Delay	SPST, N. O. Contacts; 115 v a-c Coil	AW	1040-65-1	L62203-1	
K6-B	Relay, 1600 v Supply Overload	SPST, N. C. Contacts	AD	206BM	A62214-1	
K7-B	Relay, 1500 v Supply Overload	Same as K6-B				
K8-B	Contactor, Plate	Same as K4-B				
K9-B	Relay, Underload	SPST, N. O. Contacts	AD	Series 953	A62217-1	
F1-B	Fuse, 230 v Line	250 v, 15 a	EC	1115	A65307-5	
F2-B	Fuse, 115 v Line	250 v, 30 a	EC	1130	A65307-8	
F3-B	Fuse, Blower	250 v, 2 a	EC	1102	A65307-14	
F4-B	Fuse, L. V. Plate Supplies	Same as F3-B				
F5-B	Fuse, 1500 v Plate Supply	Same as F1-B				
F6-B	Fuse, 1600 v Plate Supply	250 v, 20 a	EC	1120	A65307-6	
F7-B	Fuse, Bias and Keyer Filament	250 v, 1 a	EC	1101	A65307-1	
F8-B	Fuse, 1600 v Filament	Same as F7-B				
F9-B	Fuse, 1500 v Filament	Same as F7-B				
F10-B	Fuse, L. V. Filament	Same as F7-B				
F11-B	Fuse, Mod. Filament	Same as F3-B				
F12-B	Fuse, No. 2 Channel Filament	Same as F3-B				
F13-B	Fuse, No. 1 Channel Filament	Same as F3-B				
X1-B	Choke, Relay Supply	75 ma, 6 hy	TH	T44832	L20683-1	
A1-B	Rectifier, Relay Supply	Dry Selenium Unit; 75 ma	ITD	2B7CM1	A63300-3	

1600/400 VOLT POWER SUPPLY

C1-C	Capacitor, 1600 v Input	8 mfd ±10%; 2000 v	AX	26911-1	A-10941-1	
C2-C	Capacitor, 1600 v Output	Same as C1-C				
C3-C	Capacitor, 400 v Output	Same as C1-B				

TABLE OF REPLACEABLE PARTS

1600/400 VOLT POWER SUPPLY (Cont.)

Symbol	Name or Function	Description	Mfr.	Mfr. Identification	AIRACO Part No.	Notes
C4-C	Capacitor, 400 v Input	Same as C1-B				
R1-C	Resistor, 1600 v Bleeder	40,000 ohms ±5% ; Style A	OM	Special	A61308-47	
R2-C	Resistor, 400 v Bleeder	12,500 ohms ±5% ; Style D	OM	Special	A61302-42	
T1-C	Transformer, H. V. Filament	Pri : 115 v; Sec : 5 v @ 5 a	TH	T44823	L20653-1	
T2-C	Transformer, H. V. Plate	Pri : 115 v; Sec : 1900/0/1900 v @ 400 ma	TH	T44928	L20672-1	
T3-C	Transformer, L. V. Plate	Pri : 115 v; Sec : 550/0/550 v @ 175 ma	TH	T44833	L20659-1	
T4-C	Transformer, L. V. Filament	Pri : 115 v; Sec : 5 v @ 3 a	TH	T44826	L20654-1	
X1-C	Choke, 1600 v Input	525 ma; 9-20 hy	TH	T44930	L20689-1	
X2-C	Choke, 1600 v Output	525 ma; 10 hy	TH	T44931	L20690-1	
X3-C	Choke, 400 v Input	175 ma; 4-10 hy	TH	T44834	L20680-1	
X4-C	Choke, 400 v Output	175 ma; 6 hy	TH	T44835	L20681-1	
VT1-C	Vacuum Tube, Rectifier	Commercial Type 866A	RCA	VT-46A		
VT2-C	Vacuum Tube, Rectifier	Same as VT1-C				
VT3-C	Vacuum Tube, Rectifier	Commercial Type 5Z3	RCA	VT-145		
V1-C	Socket for VT1-C	4-Prong Steatite	AP	SS4	A65209-11	
V2-C	Socket for VT2-C	Same as V1-C				
V3-C	Socket for VT3-C	Same as V1-C				

1500/350 VOLT POWER SUPPLY

C1-D	Capacitor, 1500 v Input	Same as C1-C				
C2-D	Capacitor, 1500 v Output	Same as C1-C				
C3-D	Capacitor, 350 v Output	Same as C1-B				
C4-D	Capacitor, 350 v Input	Same as C1-B				
R1-D	Resistor, 1500 v Bleeder	Same as R1-C				
R2-D	Resistor, 350 v Bleeder	Same as R2-C				
T1-D	Transformer, H. V. Filament	Same as T1-C				
T2-D	Transformer, H. V. Plate	Pri : 115 v; Sec : 1800/0/1800 v @ 400 ma	TH	T44929	L20671-1	

TABLE OF REPLACEABLE PARTS

1500/350 VOLT POWER SUPPLY

Symbol	Name or Function	Description	Mfr.	Mfr. Identification	AIRACO Part No.	Notes
T3-D	Transformer, L. V. Plate	Pri: 115 v; Sec: 495/0/495 v @ 175 ma	TH	T45237	L20657-1	
T4-D	Transformer, L. V. Filament	Same as T4-C				
X1-D	Choke, 1500 v Input	Same as X1-C				
X2-D	Choke, 1500 v Output	Same as X2-C				
X3-D	Choke, 350 v Input	Same as X3-C				
X4-D	Choke, 350 v Output	Same as X4-C				
VT1-D	Vacuum Tube, Rectifier	Same as VT1-C				
VT2-D	Vacuum Tube, Rectifier	Same as VT1-C				
VT3-D	Vacuum Tube, Rectifier	Same as VT3-C				
V1-D	Socket for VT1-D	Same as V1-C				
V2-D	Socket for VT2-D	Same as V1-C				
V3-D	Socket for VT3-D	Same as V1-C				

VOICE AMPLIFIER AND MODULATOR

C1-E	Capacitor, VT-86 Bias Filter	2 mfd ±10%; 400 v	AX	Type 430	A61041-10	
C2-E	Capacitor, VT-86 Cathode By-Pass	Same as C1-B				
C4-E	Capacitor, VT-65 to VT-88 Coupling	0.05 mfd ±10%; 400 v	AX	Type 489	A61040-10	
C5-E	Capacitor, VT-86 to VT-65 Coupling	Same as C4-E				
C6-E	Capacitor, VT-86 Plate By-Pass	Same as C1-B				
C7-E	Capacitor, VT-65 Cathode By-Pass	Same as C1-B				
C8-E	Capacitor, VT-65 Plate By-Pass	Same as C1-E				
C9-E	Capacitor, VT-86 Bias Filter	Same as C1-E				
R1-E	Resistor, VT-86 Bias Filter	250,000 ohms ±10%; ½ w	IRC	BT-½	L61319-182	
R2-E	Resistor, VT-86 Bias Filter	75,000 ohms ±10%; 1 w	IRC	BT-1	L61333-165	
R3-E	Resistor, VT-86 Cathode	500 ohms ±10%; 1 w	IRC	BT-1	L61333-100	
R4-E	Resistor, VT-86 Plate Loading	36,000 ohms ±10%; 2 w	IRC	BT-2	L61336-156	
R6-E	Resistor, VT-86 Plate Dropping	15,000 ohms ±10%; 2 w	IRC	BT-2	L61336-142	
R7-E	Resistor, VT-88 Plate Dropping	10,000 ohms ±10%; 2 w	IRC	BT-2	L61336-138	

TABLE OF REPLACEABLE PARTS

VOICE AMPLIFIER AND MODULATOR (Cont.)

Symbol	Name or Function	Description	Mfr.	Mfr. Identification	AIRACO Part No.	Notes
R9-E	Resistor, VT-65 Cathode	1,000 ohms ±10% ; 1 w	IRC	BT-1	L61333-108	
R10-E	Resistor, VT-65 Plate Dropping	Same as R7-E				
R11-E	Resistor, DB Meter Control	600-ohm Wirewound Potentiometer	MY	M600P	A61378-1	
R12-E	Resistor, Compression Control	500,000-ohm Potentiometer	IRC	CP	A61379-2	
R13-E	Resistor, VT-88 Cathode	1,000 ohms ±10% ; ½ w	IRC	BT-½	L61319-108	
R14-E	Resistor, VT-88 Cathode	5,000 ohms ±10% ; 1 w	IRC	BT-1	L61333-130	
R15-E	Resistor, VT-95 Cathode	630 ohms ±5% ; Style E	OM	Special	A61300-29	
R16-E	Resistor, VT-65 Grid	Same as R12-E				
T1-E	Transformer, Filament	Pri : 115 v ; Sec : 10 v @ 7 a ; 2.5 v @ 6 a ; 6.3 v @ 1 a	TH	T44818	L20651-1	
T2-E	Transformer, Interstage	10,000-ohm Plate to Push-Pull Grids ; Extra 600-ohm db Meter Winding	TH	T44821	L20660-1	
T3-E	Transformer, Interstage	Push-Pull Plates to Push-Pull Grids	TH	T44820	L20656-1	
T4-E	Transformer, Modulation	Separate Plate and Screen Windings for P. A. Tubes	TH	T44819	L20673-1	
T5-E	Transformer, Compressor Output	Plate to Push-Pull Diodes	TH	T45126	L20668-1	
VT1-E	Vacuum Tube, Input	Commercial Type 6K7	RCA	VT-86		
VT2-E	Vacuum Tube, Amplifier	Commercial Type 6C5	RCA	VT-65		
VT3-E	Vacuum Tube, Driver	Commercial Type 2A3	RCA	VT-95		
VT4-E	Vacuum Tube, Driver	Same as VT3-E				
VT5-E	Vacuum Tube, Modulator	Commercial Type 805	RCA	VT-143		
VT6-E	Vacuum Tube, Modulator	Same as VT5-E				
VT7-E	Vacuum Tube, Compressor	Commercial Type 6R7	RCA	VT-88		
V1-E	Socket for VT1-E	Octal ; Steatite	AP	SS8	A65200-503	
V2-E	Socket for VT2-E	Same as V1-E				
V3-E	Socket for VT3-E	Same as V1-C				
V4-E	Socket for VT4-E	Same as V1-C				
V5-E	Socket for VT5-E	Giant 4-Prong ; Steatite	EFJ	211SB	A65204-4	
V6-E	Socket for VT6-E	Same as V5-E				
V7-E	Socket for VT7-E	Same as V1-E				

TABLE OF REPLACEABLE PARTS

RADIO FREQUENCY UNIT

Symbol	Name or Function	Description	Mfr.	Mfr. Identification	AIRACO Part No.	Notes
C1-F	Capacitor, Osc. Cathode Tuning	.0005 mfd ±10%; 600 v	AX	1650LST	L61000-13LST	
C2-F	Capacitor, Osc. Cathode By-Pass	.01 mfd ±10%; 600 v	AX	1650LST	L61000-25LST	
C3-F	Capacitor, Osc. Screen By-Pass	Same as C2-F				
C4-F	Capacitor, Osc. Plate By-Pass	Same as C2-F				
C5-F	Capacitor, Osc. Plate Tuning	.0005 mfd; Variable	EFJ	500E20	L61212-3	
C6-F	Capacitor, Osc.-Buffer Coupling	.0001 mfd ±5%; 1200 v	AX	1651LST	L61015-4LST	
C7-F	Capacitor, Buffer Cathode By-Pass	Same as C2-F				
C8-F	Capacitor, Buffer-P. A. Coupling	.01 mfd ±10%; 1200 v	AX	1651LST	L61014-22LST	
C9-F	Capacitor, P. A. Grid Tank	Same as C6-F				
C10-F	Capacitor, P. A. Grid Tank	Same as C6-F				
C11-F	Capacitor, P. A. Grid Tuning	200 mmf; Variable	EFJ	200FD20	L61209-5	
C12-F	Capacitor, P. A. Fil. By-Pass	Same as C2-F				
C13-F	Capacitor, P. A. Fil. By-Pass	Same as C2-F				
C14-F	Capacitor, P. A. Screen By-Pass	.002 mfd ±10%; 1200 v	AX	1651LST	L61014-15LST	
C15-F	Capacitor, P. A. Plate Coupling	.002 mfd ±5%; 600 v	AX	1550LS-221	M61001-16LST	
C16-F	Capacitor, P. A. Plate Coupling	Same as C15-F				
C17-F	Capacitor, Antenna Loading	1000 mmf; Variable	EFJ	1000D35	L20155-2	
C18-F	Capacitor, P. A. Plate Tuning	216 mmf; Variable	EFJ	216DD45	L61223-1	
C19-F	Capacitor, P. A. Plate Tank	80 mmf; Air, Fixed	CW	JD-80-OS	A61214-14	
C20-F	Capacitor, P. A. Plate Tank	Same as C19-F				
C21-F	Capacitor, Buffer Screen By-Pass	Same as C2-F				
R1-F	Resistor, Oscillator Grid	50,000 ohms ±10%; 1 w	IRC	BT-1	L61333-160	
R2-F	Resistor, Oscillator Screen	15,000 ohms ±5%; Style D	OM	Special	A61302-43	
R3-F	Resistor, Buffer Grid	Same as R1-F				
R4-F	Resistor, Buffer Screen	Same as R2-F				
R5-F	Resistor, Buffer Screen	Same as R2-F				
L1-F	Inductor, Osc. Cathode Tuning	2.1 mh; 100 ma	H	CH-X	A63200-2	
L2-F	Inductor, Osc. Plate Tuning	27 turns No. 20 Tinned Wire on Alsimag Form	AIR-ACO		B6154-501	
L3-F	Inductor, P. A. Grid Tuning	70 turns No. 20 wire on Alsimag Form; 5 taps	AIR-ACO		B6153-501	
L4-F	Inductor, P. A. Plate Tuning	Edgewise Wound Copper Strip, Silver Plated	AIR-ACO		C6205-501	

TABLE OF REPLACEABLE PARTS

RADIO FREQUENCY UNIT (Cont.)

Symbol	Name or Function	Description	Mfr.	Mfr. Identification	AIRACO Part No.	Notes
L5-F	Inductor, P. A. Plate Tuning	Edgewise Wound Copper Strip, Silver Plated	AIR-ACO		C6219-501	
L6-F	Choke, Buffer Plate	Same as L1-A				
L7-F	Choke, P. A. Plate	2.5 mh; 500 ma	AIR-		A10124-502	
L8-F	Choke, P. A. Plate	Same as L7-F	ACO			
L9-F	Choke, P. A. Grid	2.5 mh; 100 ma	NC	R-100-U	A63201-1	
T1-F	Transformer, Filament	Pri: 115 v; Sec: 10 v @ 10 a; 6.3 v @ 1 a; 12.6 v @ 1 a	TH	T44816	L20650-1	
VT1-F	Vacuum Tube, Oscillator	Commercial Type 837	RCA	VT-101		
VT2-F	Vacuum Tube, Buffer	Commercial Type 807	RCA	VT-100		
VT3-F	Vacuum Tube, Power Amplifier	Commercial Type 813	RCA	VT-144		
VT4-F	Vacuum Tube, Power Amplifier	Same as VT3-F				
V1-F	Socket for VT1-F	Large 7-Prong; Steatite	AP	SS7L	A65205-503	
V2-F	Socket for VT2-F	5-Prong; Steatite	AP	SS5	A65209-12	
V3-F	Socket for VT3-F	Giant 7-Prong; Steatite	EFJ	237	A65206-1	
V4-F	Socket for VT4-F	Same as V3-F				

BIAS SUPPLY AND KEYER UNIT

C1-G	Capacitor, Bias Input Filter	Same as C1-B				
C2-G	Capacitor, Bias Output Filter	Same as C1-B				
C3-G	Capacitor, Keyer Bias Filter	Same as C1-E				
C4-G	Capacitor, VT-65 Cathode By-Pass	Same as C1-E				
C5-G	Capacitor, VT-66 Cathode By-Pass	Same as C1-E				
C6-G	Capacitor, VT-65 to VT-66 Coupling	Same as C4-E				
C7-G	Capacitor, VT-65 Plate By-Pass	Same as C1-E				
C8-G	Capacitor, Mic. Voltage Filter	Same as C1-B				
R1-G	Resistor, Bias Bleeder	100 Ohms ±10%; 1 w	IRC	BW-1	L61345-78	
R2-G	Resistor, Bias Bleeder	3150 Ohms ±5%; Style E	OM	Special	A61300-36	
R3-G	Resistor, Bias Bleeder	2,000 Ohms ±5%; Style E	OM	Special	A61300-34	

TABLE OF REPLACEABLE PARTS

BIAS SUPPLY AND KEYER UNIT (Cont.)

Symbol	Name or Function	Description	Mfr.	Mfr. Identification	AIRACO Part No.	Notes
R4-G	Resistor, Input Gain Control	Same as R12-E				
R5-G	Resistor, VT-66 Cathode	500 Ohms ±10% ; 2 w	IRC	BT-2	L61336-100	
R6-G	Resistor, Tone Bleeder	Same as R2-B				
R7-G	Resistor, Keyer Cathode	150,000 Ohms ±10% ; 1 w	IRC	BT-1	L61333-172	
R8-G	Resistor, Keyer Bias Filter	25,000 Ohms ±10% ; 2 w	IRC	BT-2	L61336-152	
R9-G	Resistor, Bias Bleeder	1,500 Ohms ±5% ; Style E	OM	Special	A61300-33	
R10-G	Resistor, Bias Bleeder	5,000 Ohms ±5% ; Style E	OM	Special	A61300-38	
R11-G	Resistor, VT-65 Cathode	1,500 Ohms ±10% ; 1 w	IRC	BT-1	L61333-112	
R12-G	Resistor, VT-65 Plate	Same as R1-F				
R13-G	Resistor, VT-66 Grid	500,000 Ohms ±10% ; 1 w	IRC	BT-1	L61333-190	
R14-G	Resistor, Voltage Dropping	2,500 Ohms ±10% ; 10 w	OM	Brown Devil	A61376-41	
T1-G	Transformer, Keyer Fil.	Pri: 115 v; Sec: 5 v @ 3 a, 6.3 v @ 1 a, 6.3 v @ 1 a, 20 v @ 50 ma	TH	T45236	L20652-1	
T2-G	Transformer, Input	600-Ohm Line to Grid	TH	T44822	L20655-1	
T3-G	Transformer, Tone Amp. Output	Pri. to Sec. Ratio, 1-10	TH	T45128	L20669-1	
T4-G	Transformer, Bias Plate Supply	Pri: 115 v; Sec: 420/0/420 v @ 75 ma	TH	T44827	L20658-1	
T5-G	Transformer, Bias Supply Fil.	Same as T4-C				
X1-G	Choke, Bias Supply Input	75 ma, 7-12 hy	TH	T44831	L20682-1	
X2-G	Choke, Bias Supply Output	Same as X1-B				
X3-G	Choke, Microphone Filter	10 ma, 20 hy	TH	T45333	L20687-1	
X4-G	Filter, Keyer Input	Low Pass L-C Filter	TH	T45125A	L20686-1	
VT1-G	Vacuum Tube, Tone Input	Same as VT2-E				
VT2-G	Vacuum Tube, Tone Amplifier	Commercial Type 6F6	RCA	VT-66		
VT3-G	Vacuum Tube, Tone Rectifier	Same as VT3-C				
VT4-G	Vacuum Tube, Keyer	Same as VT2-E				
VT5-G	Vacuum Tube, Bias Rectifier	Same as VT3-C				
V1-G	Socket for VT1-G	Same as V1-E				
V2-G	Socket for VT2-G	Same as V1-E				
V3-G	Socket for VT3-G	Same as V1-C				
V4-G	Socket for VT4-G	Same as V1-E				
V5-G	Socket for VT5-G	Same as V1-C				
A3-G	Rectifier, Keyer Bias	Selenium Type; 75 ma	ITD	IB4A1	A63300-4	

TABLE OF REPLACEABLE PARTS

REMOTE CONTROL UNIT RM-22-D

Symbol	Name or Function	Description	Mfr.	Mfr. Identification	AIRACO Part No.	Notes
C1	Capacitor, Input Filter	Same as C1-B				
C2	Capacitor, Output Filter	Same as C1-B				
C3	Capacitor, Microphone Filter	Same as C1-B				
C4	Capacitor, VT-65 Cathode By-Pass	Same as C1-B				
C5	Capacitor, Key Click Filter	0.5 mfd. ±10%; 400 v	AX	Type 489	A61040-13	
C6	Capacitor, Key Click Filter	Same as C5				
C7	Capacitor, Dry Rectifier Filter	Same as C1-B				
C8-13	Capacitors, Audio Tone Control	*	AX	1467	L61009	
C14	Capacitor, Tone Osc. Plate By-Pass	Same as C1-E				
C15	Capacitor, Osc.-Amp. Cath. By-Pass	Same as C1-E				
C16	Capacitor, Tone Amp. Plate By-Pass	Same as C1-E				
C17	Capacitor, Osc.-Amp. Coupling	Same as C4-E				
R1	Resistor, Power Supply Bleeder	Same as R2-C				
R2	Resistor, Microphone Supply	Same as R5-G				
R3	Resistor, VT-65 Cathode	Same as R9-E				
R4	Resistor, Audio Level Control	Same as R1-A				
R5	Resistor, Tone Osc. Plate	Same as R1-F				
R6	Resistor, Tone Amp. Cath. By-Pass	Same as R9-E				
R7-12	Resistors, Tone Osc. Cathode	*	IRC	BT-¼	L61340	
R13	Resistor, Tone Level Control	Same as R12-E				
R14	Resistor, MCW Level Control	5,000-Ohm Potentiometer	IRC	CP	A61379-1	
R15	Resistor, Cathode Keying	Same as R1-F				
R16	Resistor, Cathode Blocking	300,000 Ohms ±10%; 1 w	IRC	BT-1	L61333-184	
R17	Resistor, Microphone Decoupling	200 Ohms ±10%; ½ w	IRC	BW-½	L61342-85	
R18	Resistor, VT-65 Grid	12,000 Ohms ±10%; ¼ w	IRC	BT-¼	L61339-140	
T1	Transformer, Power	Pri: 115 v; Sec: 105, 90, 75, 60 v Tapped Winding, 350/0/350 v @ 135 ma, 6.3 v @ 1 a, 5 v @ 3 a	TH	T45219	L20661-1	
T2	Transformer, Input	S.B. Mic to Grid	TH	T44937	L20664-1	
T3	Transformer, Oscillation	Interstage Audio	TH	T45335	L20666-1	
T4	Transformer, Tone Amp. Output	Plate to Two 600-Ohm Lines	TH	T45124	L20662-1	
T5	Transformer, VT-65 Amp. Output	Plate to 600-Ohm Line	TH	T44933	L20663-1	
X1	Choke, Power Supply Input	135 ma; 9-15 hy	TH	T44828	L20685-1	

*Individually Selected for Each Equipment; for Replacement, Order Same Value as Marked Inside Remote Case.

TABLE OF REPLACEABLE PARTS
REMOTE CONTROL UNIT RM-22-D (Cont.)

Symbol	Name or Function	Description	Mfr.	Mfr. Identification	AIRACO Part No.	Notes
X2	Choke, Power Supply Output	135 ma; 8 hy	TH	T44829	L20684-1	
X3	Choke, Microphone Filter Supply	10 ma; 15 hy	TH	T45334	L20688-1	
X4	Choke, Key Click Filter	Same as X3-G				
X5	Choke, Dry Rectifier Filter	Same as X1-B				
I1	Receptacle, Indicator Lamp	Same as I2-A				
K1	Relay, Receiver Disabling	SPDT Contacts	KU	223C34	L62207-359	
S1	Switch, Line	SPST Toggle	H&H	20982	LG2000-1	
S2	Switch, Emission Selector	3 Wafer, 6 Pole, 7-Position Rotary	OAK	*	A10969-1	
S3	Switch, Oscillator Tone	2 Wafer, 2 Pole, 6-Position Rotary	OAK	**	A10967-1	
S4	Switch, Relay Voltage Tap	Same as S2-B				
J1	Jack, Microphone	Same as J1-A				
J2	Jack, Key	Same as J1-A				
F1	Fuse, Line	1.5 a, 250 v	LF	1041	A65301-2	
M1	Meter, Output Level	Same as M8-A				
VT1	Vacuum Tube, Power Rectifier	Same as VT3-C				
VT2	Vacuum Tube, Audio Amplifier	Same as VT2-E				
VT3	Vacuum Tube, Tone Osc.-Amp.	Commercial Type 6F8G	RCA	VT-99		
V1	Socket for V1	Same as V1-C				
V2	Socket for V2	Same as V1-E				
V3	Socket for V3	Same as V1-E				
A1	Rectifier, Relay Supply	Same as A1-B				
A2	Microphone	S. B. Carbon; 200 Ohms	WE	1120DA	A63525-1	

*Mfd. by AIRACO Drawing A-10969-1 **Mfd. by AIRACO Drawing A-10967-1

TABLE OF MISCELLANEOUS REPLACEABLE PARTS

Item	Description	Mfr.	Mfr. Identification	AIRACO Part No.	Notes
Coil	Replacement for Series 975 relays K1-B and K2-B	AD		A62215-2	
Coil	Replacement for Series 951 relay K3-B	AD		A62216-2	
Coil	Replacement for Type 206BM relays K6-B and K7-B	AD		A62214-3	
Coil	Replacement for Series 953 relay K9-B	AD		A62217-2	
Contact Set	Replacement for Series 975 relays K1-B and K2-B	AD		A62215-3	
Contact Set	Replacement for Series 951 relay K3-B	AD		A62216-3	
Contact Set	Replacement for Type 206BM relays K6-B and K7-B	AD		A62214-2	
Contact Set	Replacement for Series 953 relay K9-B	AD		A62217-3	
Coupling	Friction Type for R-F Tuning Capacitors	EFJ	258	A60681-1	
Dial	Replacement for C5-F, C11-F, C17-F, and C18-F	CR	294	L60700-3	
Dust Filter	Spun Glass—19½"x10"x2"	FP		A63040-4	
Insulator	Conical Stand-Off—1"x¾" diameter	EFJ	501	A65602-2	
Insulator	Square Post Stand-Off—¾"x1¼"	AL	1080	A65608-2	
Insulator	Antenna Feed-Through Bushing	AL	1168	A65614-11	
Insulator	Feed-Through Bushing—⅜"x⅝" diameter	AL	1173	A65612-2	
Insulator	Feed-Through Bushing—⅞"x1¼" diameter	AL	1160	A65613-31	
Insulator	Slotted Coil Supports for L4-F and L5-F	AL		B5954-1	
Knob	Replacement for R1-A, S2-A, S6-A, S7-A and R4	CR	637J	L60535-5	
Knob	Replacement for S2 and S3	OM	5116	L60536-4	
Knob	Replacement for S4, R13, R14, R4-G, R11-F, R12-E, R16-E and S2-B	CR	286	L60536-3	
Plug	2-contact female—for A1A	H&H	MB	A62407-3	
Socket	2-contact male—for A1A	H&H	754	A62407-4	

LIST OF SPARE PARTS

Quan.	Symbols	Identification
1	R1-B	Resistor; 50 Ohms, Style E; Ohmite
1	R2-B, R6-G	Resistor, 25,000 Ohms, 1 w; IRC BT-1
1	R1-C, R1-D	Resistor, 40,000 Ohms, Style A; Ohmite
2	R2-C, R2-D, R1	Resistor, 12,500 Ohms, Style D; Ohmite
1	R1-E	Resistor, 250,000 Ohms, ½ w; IRC BT-½
1	R4-E	Resistor, 36,000 Ohms, 2 w; IRC BT-2
1	R7-G	Resistor, 150,000 Ohms, 1 w; IRC BT-1
1	R6-E	Resistor, 15,000 Ohms, 2 w; IRC BT-2
1	R7-E, R10-E	Resistor, 10,000 Ohms, 2 w; IRC BT-2
2	R9-E, R3, R6	Resistor, 1,000 Ohms, 1 w; IRC BT-1
1	R13-E	Resistor, 1,000 Ohms, ½ w; IRC BT-½
1	R14-E	Resistor, 5,000 Ohms, 1 w; IRC BT-1
1	R15-E	Resistor, 630 Ohms, Style E; Ohmite
4	R1-F, R3-F, R12-G, R5, R15	Resistor, 50,000 Ohms, 1 w; IRC BT-1
3	R2-F, R4-F, R5-F	Resistor, 16,000 Ohms, Style D; Ohmite
1	R1-G	Resistor, 100 Ohms, 1 w; IRC BW-1
1	R2-G	Resistor, 3150 Ohms, Style E; Ohmite
1	R3-G	Resistor, 2,000 Ohms, Style E; Ohmite
1	R5-G, R2	Resistor, 500 Ohms, 2 w; IRC BT-2
1	R10-G	Resistor, 5,000 Ohms, Style E; Ohmite
1	R9-G	Resistor, 1500 Ohms, Style E; Ohmite
1	R11-G	Resistor, 1500 Ohms, 1 w; IRC BT-1
1	R13-G	Resistor, 500,000 Ohms, 1 w; IRC BT-1
1	R14-G	Resistor, 2500 Ohms, 10 w; Ohmite Brown Devil
1	R17	Resistor, 200 Ohms, ½ w; IRC BW-½
1	R18	Resistor, 12,000 Ohms, ¼ w; IRC BT-¼
1	R2-E	Resistor, 75,000 Ohms, 1 w; IRC BT-1
1	R3-E	Resistor, 500 Ohms, 1 w; IRC BT-1
1	R16	Resistor, 300,000 Ohms, 1 w; IRC BT-1
1	R3-B	Thermal Overload Coil, 18a, Cutler-Hammer H173
1	R4-B	Thermal Overload Coil, 30a, Cutler-Hammer H324
1	R8-G	Resistor, 25,000 Ohms, 2 w; IRC BT-2
1	R4-A, R5-A	Resistor, 500,000 Ohms, 2 w; IRC BT-2
	50% Replacement of All Resistors Used in VT-99 Oscillator Section Cathode, Remote Unit. Values Individually Selected for Each Unit.	
3	C1-A, C2-A, C3-A, C4-A, C5-A	Capacitor, .006 mfd., 600 v; Aerovox
8	C1-B, C3-C, C4-C, C3-D, C4-D, C2-E, C6-E, C7-E, C1-G, C2-G, C8-G, C1, C2, C3, C4, C7	Capacitor, 8 mfd., 600 v; Aerovox 26911-2
2	C1-C, C1-D, C2-C, C2-D	Capacitor, 8 mfd., 2000 v; Aerovox 26911-1
5	C1-E, C8-E, C9-E, C4-G, C5-G, C7-G, C3-G, C14, C15, C16	Capacitor, 2 mfd., 400 v; Aerovox Type 430
2	C4-E, C5-E, C6-G, C17	Capacitor, .05 mfd., 400 v; Aerovox Type 489
1	C1-F	Capacitor, .0005 mfd. ±10%, 600 v; Aerovox
7	C2-F, C3-F, C4-F, C7-F, C12-F, C13-F, C21-F	Capacitor, .01 mfd. ±10%, 600 v; Aerovox

LIST OF SPARE PARTS (Cont.)

Quan.	Symbols	Identification
1	C8-F	Capacitor, .01 mfd. ±10%, 1200 v; Aerovox
3	C6-F, C9-F, C10-F	Capacitor, .0001 mfd. ±5%, 1200 v; Aerovox
1	C14-F	Capacitor, .002 mfd. ±10%, 1200 v; Aerovox
2	C15-F, C16-F	Capacitor, .002 mfd. ±10%, 6000 v; Aerovox
1	C5, C6	Capacitor, .5 mfd., 400 v; Aerovox Type 489
		50% Replacement of All Capacitors used for Tuning Oscillator in Remote Unit. Values Individually Selected for Each Unit.
1	M1-A, M2-A	Meter, 0-100 ma d-c; Weston Model 301, Rectangular Case
1	M3-A, M7-A	Meter, 0-800 ma d-c; Weston Model 301, Rectangular Case
1	M4-A	Meter, 0-2.5 kv Scale, 0-1 ma Movement; Weston Model 301, Rectangular Case
1	M5-A, M6-A	Meter, 0-1 a r-f; Weston Model 425, Rectangular Case
1	M8-A, M1	Meter, −10/0/+6 db; Weston Model 301, Rectangular Case
1	M9-A	Meter, 0-130 v a-c; Weston Model 476, Rectangular Case
1	A3-A	Meter Multiplier, 2.5 megohms ±2%; Simpson Model 25
20	F1-B, F5-B	Fuse, 15 a, 250 v; Economy 1115
10	F2-B	Fuse, 30 a, 250 v; Economy 1130
50	F3-B, F4-B, F11-B, F12-B, F13-B	Fuse, 2 a, 250 v; Economy 1102
10	F6-B	Fuse, 20 a, 250 v; Economy 1120
40	F7-B, F8-B, F9-B, F10-B	Fuse, 1 a, 250 v; Economy 1101
10	F1	Fuse, 1.5 a, 250 v; Littelfuse 1041
6		Indicator Lamp Bulbs; GE Mazda S6
2	K1-B, K2-B	Coils for Advance Series 975 Relay
4 SETS	K1-B, K2-B	Contacts for Advance Series 975 Relay
1	K3-B	Coil for Advance Series 951 Relay
2 SETS	K3-B	Contacts for Advance Series 951 Relay
2	K4-B, K8-B	Coils for Allen-Bradley A209 Contactor
4 SETS	K4-B, K8-B	Contacts for Allen-Bradley A209 Contactor
1	K5-B	Coil for Adams and Westlake 1040-65-1 Relay
2	K5-B	Mercury Plunger for Adams and Westlake 1040-65-1 Time Delay Relay
2	K6-B, K7-B	Coils for Advance 206BM Relay
4 SETS	K6-B, K7-B	Contacts for Advance 206BM Relay
1	K9-B	Coil for Advance Series 953 Relay
2 SETS	K9-B	Contacts for Advance Series 953 Relay
1	K1	Coil for Kurman 223C34 Relay
2 SETS	K1	Contacts for Kurman 223C34 Relay

LIST OF MANUFACTURERS

Symbol	Company Name	Street Address	City and State
AIRACO	Aircraft Accessories Corporation	Fairfax & Funston Roads	Kansas City, Kansas
AB	Allen-Bradley Company	128 West Greenfield Avenue	Milwaukee, Wisconsin
AD	Advance Electric Company	1260 West 2nd Street	Los Angeles, California
AL	American Lava Corporation	Kruesi Building	Chattanooga, Tennessee
AP	American Phenolic Corporation	1250 West Van Buren Avenue	Chicago, Illinois
AW	Adams & Westlake Company	319 West Ontario	Chicago, Illinois
AX	Aerovox Corporation	70 Washington	Brooklyn, New York
CH	Cutler-Hammer Incorporated	1333 West St. Paul Avenue	Milwaukee, Wisconsin
CR	Crowe Name Plate & Manufacturing Company	1765 Grace Street	Chicago, Illinois
CW	Allen D. Cardwell Manufacturing Corporation	81 Prospect Street	Brooklyn, New York
DI	Dial Light Corporation of America	90 West Street	New York, New York
EC	Economy Fuse & Manufacturing Company	Lincoln Park Station	Chicago, Illinois
EFJ	E. F. Johnson Company		Waseca, Minnesota
FAS	F. A. Smith Manufacturing Company	Davis & Toppin Streets	Rochester, New York
FP	Forslund Pump & Machinery Company	1717 Main Street	Kansas City, Missouri
GE	General Electric Company	Sales Office	Schenectady, New York
GR	General Radio Company		Cambridge, Massachusetts
H	Hammarlund Manufacturing Company, Inc.	424-438 West 33rd Street	New York, New York
HH	Hardwick-Hindle, Inc.	65 Johnson Street	Newark, New Jersey
H&H	Arrow-Hart & Hegeman	Hart & Hegeman Division	Hartford, Connecticut
IRC	International Resistance Company	401 North Broad Street	Philadelphia, Pennsylvania
ITD	International Telephone Development Company	67 Broad Street	New York, New York
KE	Kellogg Switchboard & Supply Company	1066 West Adams Street	Chicago, Illinois
KU	Kurman Electric Company, Inc.	239 Lafayette Street	New York, New York
LF	Littelfuse Laboratories	4240 Lincoln Avenue	Chicago, Illinois
MY	P. R. Mallory & Company	3029 East Washington Avenue	Indianapolis, Indiana
NC	National Company, Inc.	61 Sherman Street	Malden, Massachusetts
OAK	Oak Manufacturing Company	711 West Lake Street	Chicago, Illinois
OM	Ohmite Manufacturing Company	4836 Flournoy Street	Chicago, Illinois
PE	Penn Electric Switch Company	1933 Thomas Street	Goshen, Indiana
RCA	Radio Corporation of America	30 Rockefeller Plaza	New York, New York
S	Sola Electric Company	2523 Clybourn Avenue	Chicago, Illinois
SE	Simpson Electric Company	5216-18 Kinzie Street	Chicago, Illinois
SI	Signal Electric Manufacturing Company		Menominee, Michigan
SO	Solar Manufacturing Corporation		Bayonne, New Jersey
TH	Thordarson Electric Manufacturing Company	500 West Huron Street	Chicago, Illinois
WE	Western Electric Company	Graybar Electric Division	Kansas City, Missouri
WN	Weston Electrical Instrument Corporation	619 Frelinghuysen Avenue	Newark, New Jersey

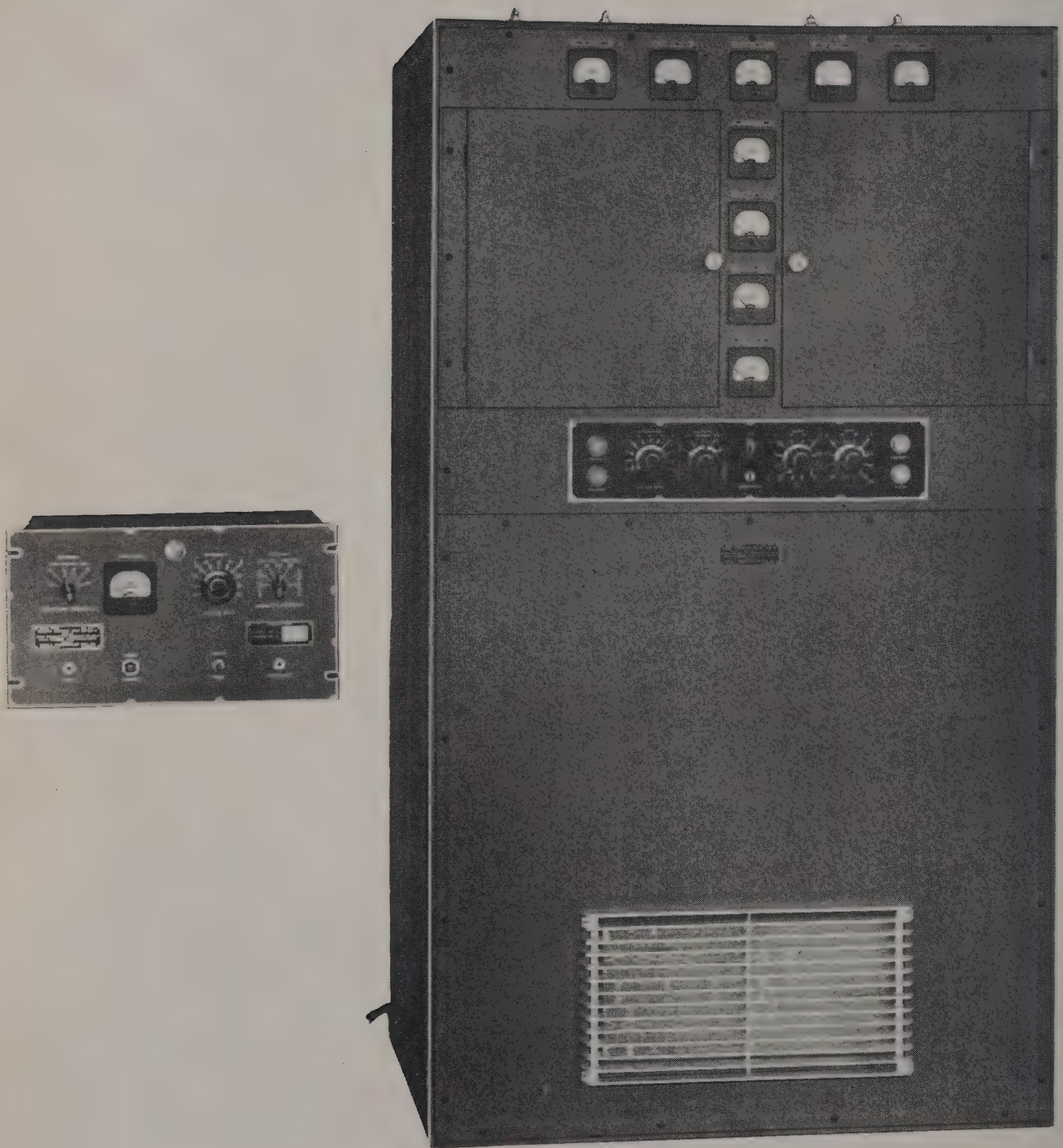


Fig. 1. Radio Transmitter BC-452-D and Remote Control Unit RM-22-D

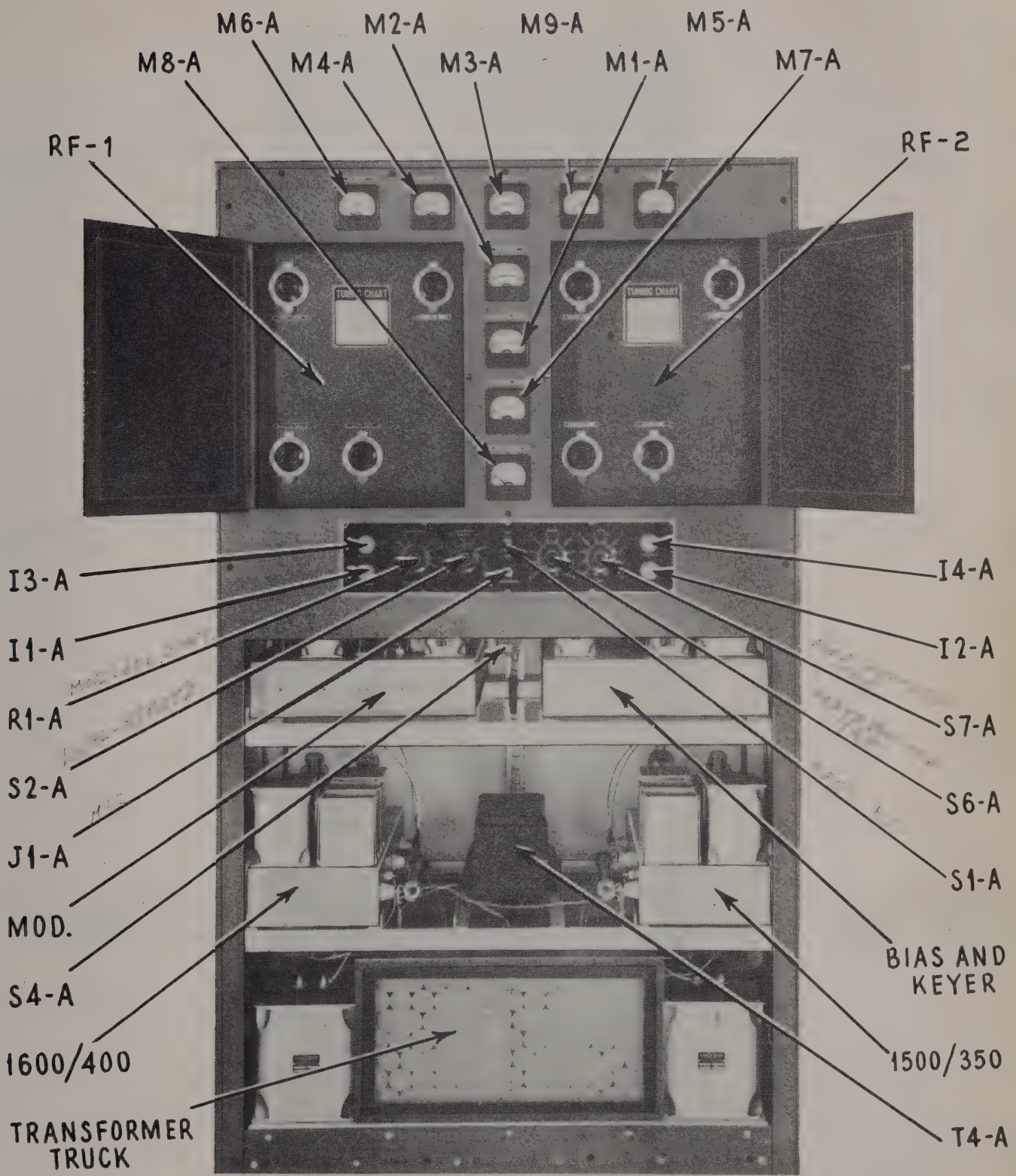


Fig. 2. Radio Transmitter BC-452-D with Shields Removed—Front View

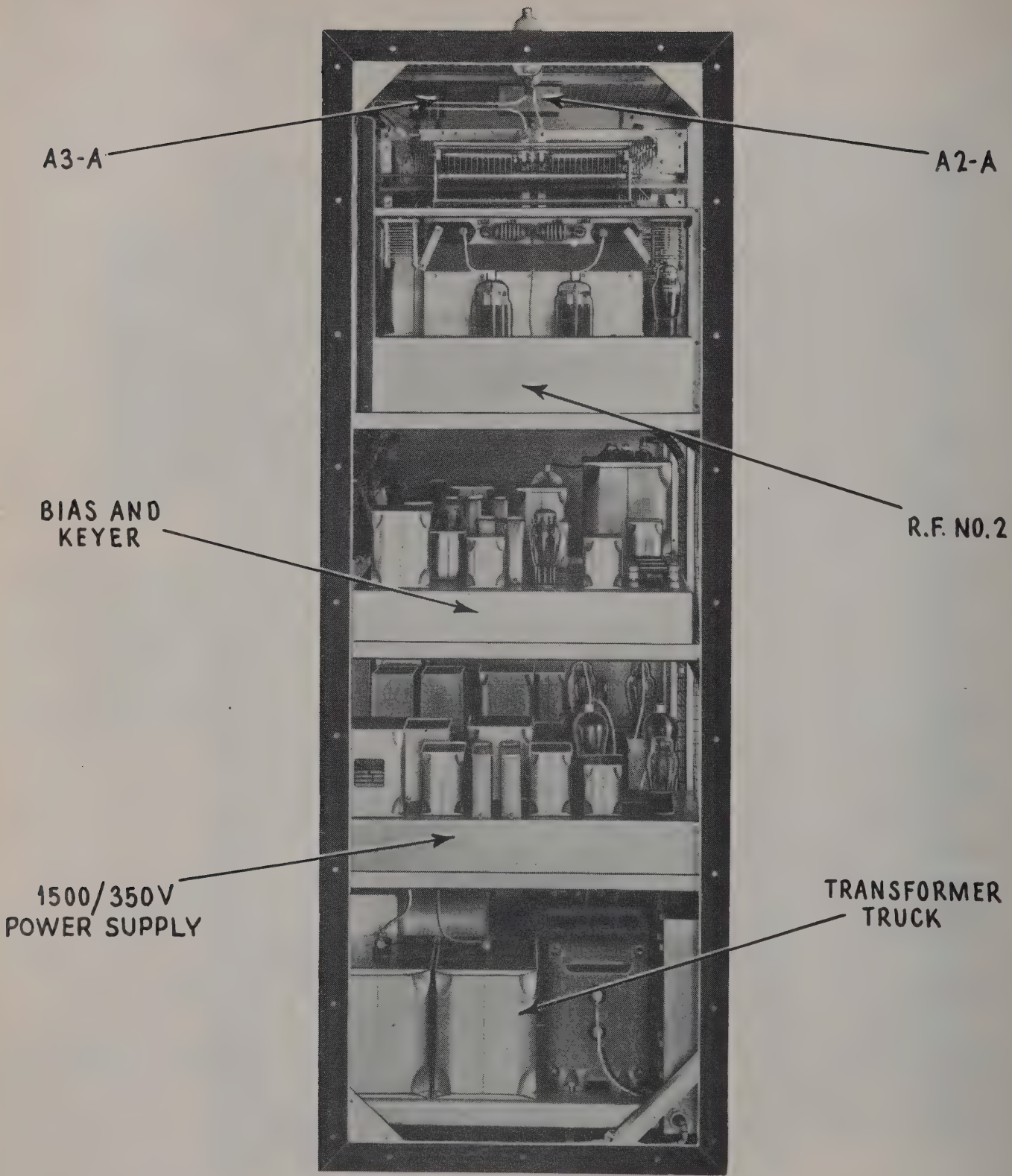


Fig. 3. Radio Transmitter BC-452-D with Shields Removed—Right Side View

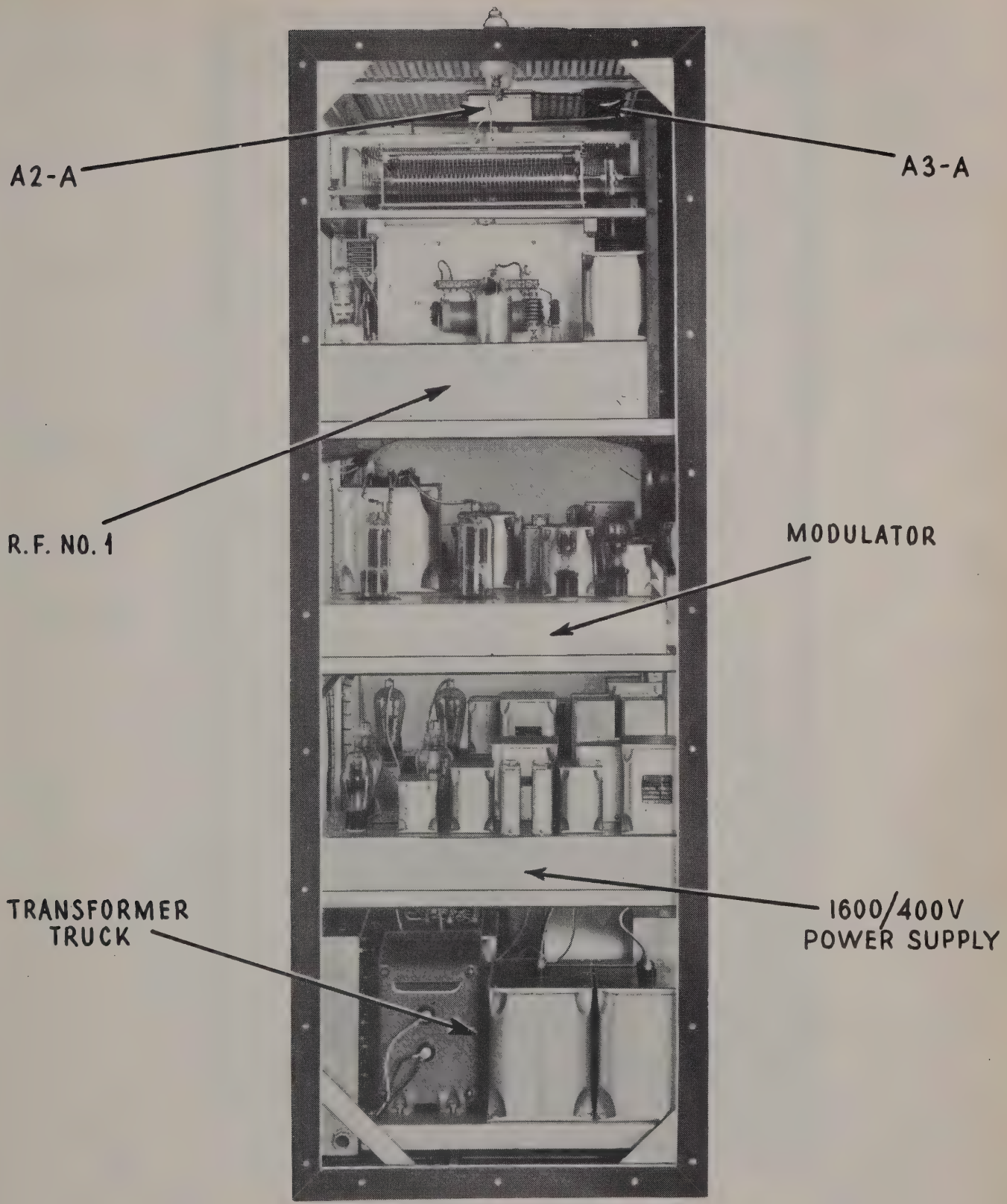


Fig. 4. Radio Transmitter BC-452-D with Shields Removed — Left Side View

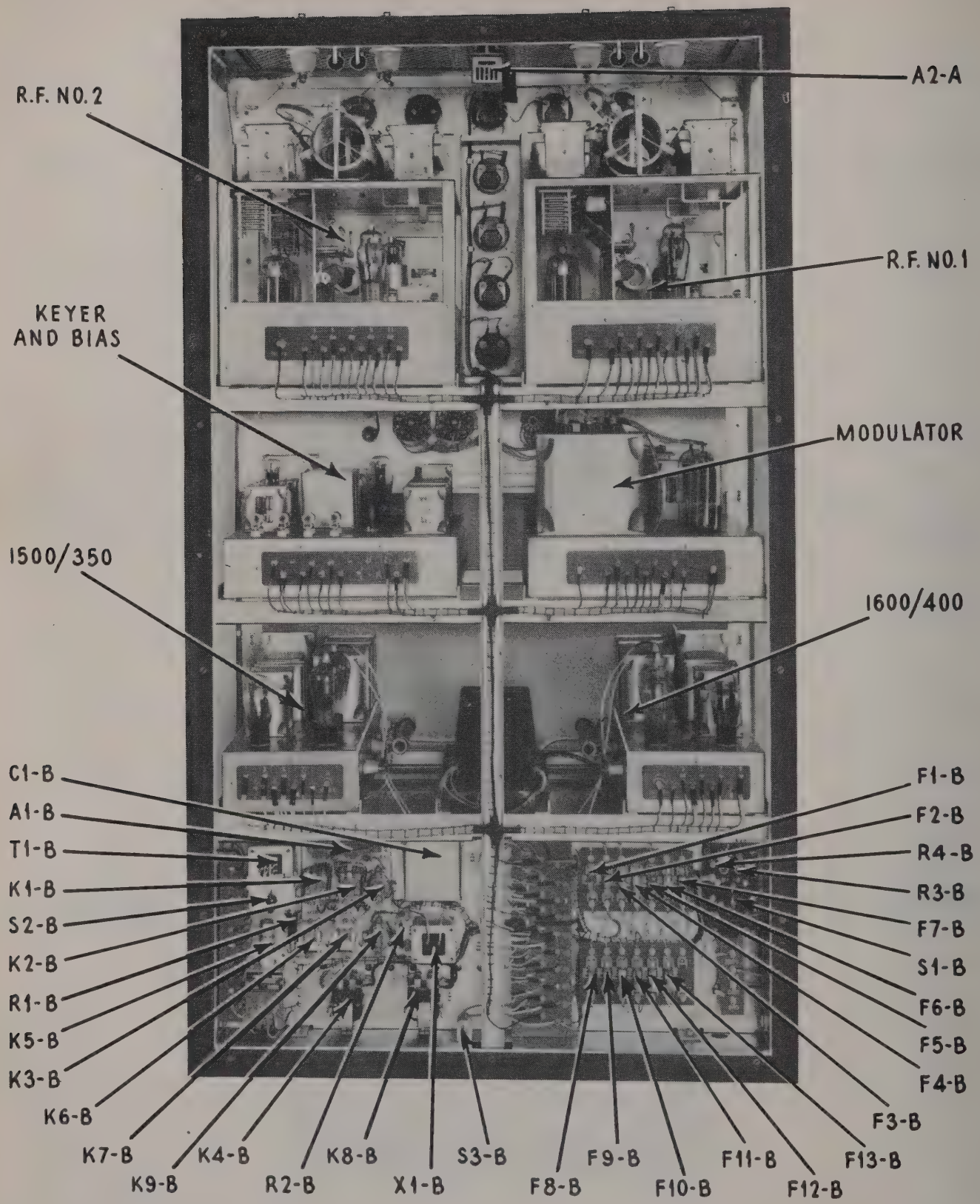


Fig. 5. Radio Transmitter BC-452-D with Shields Removed—Rear View

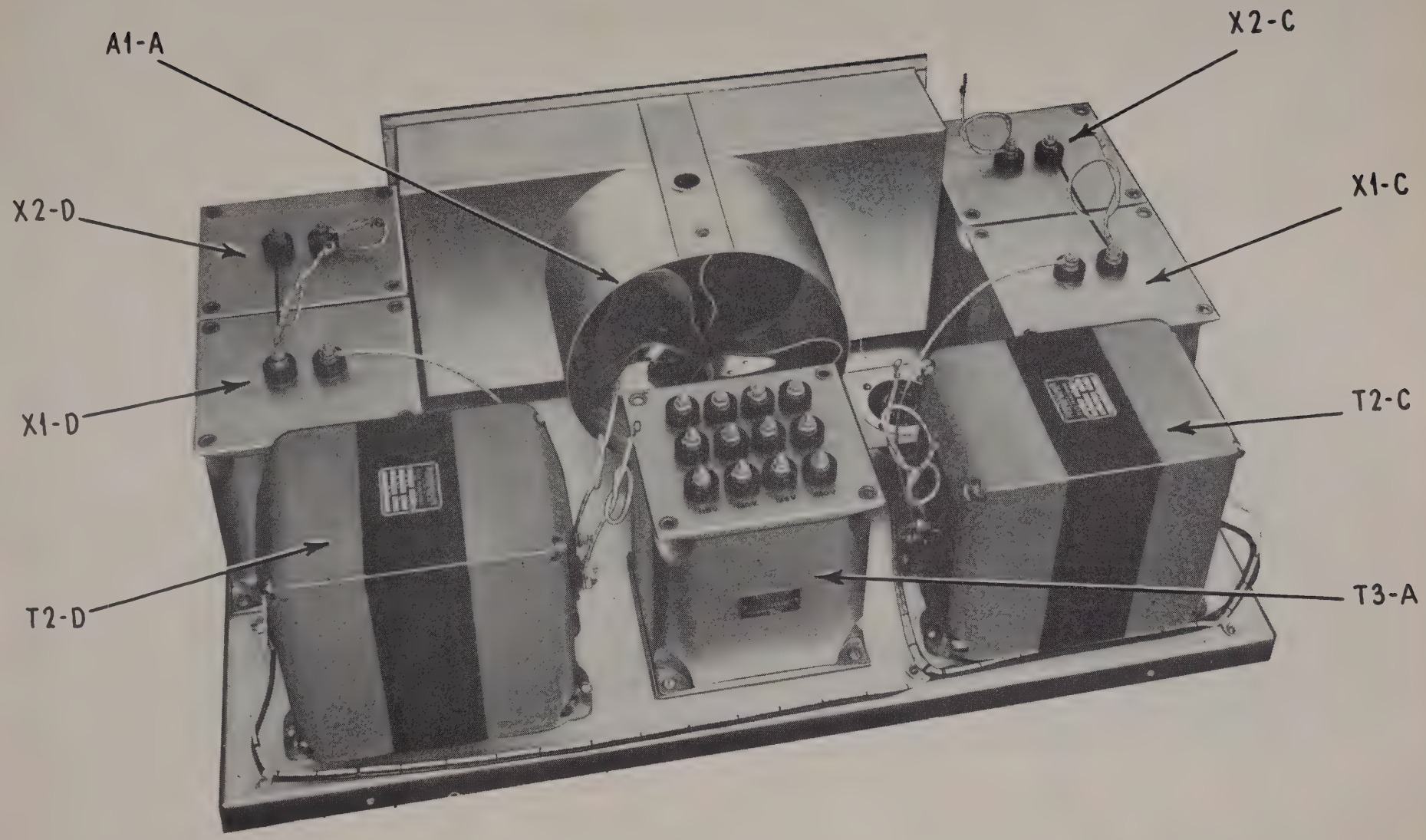


Fig. 6. Transformer Truck—Top View

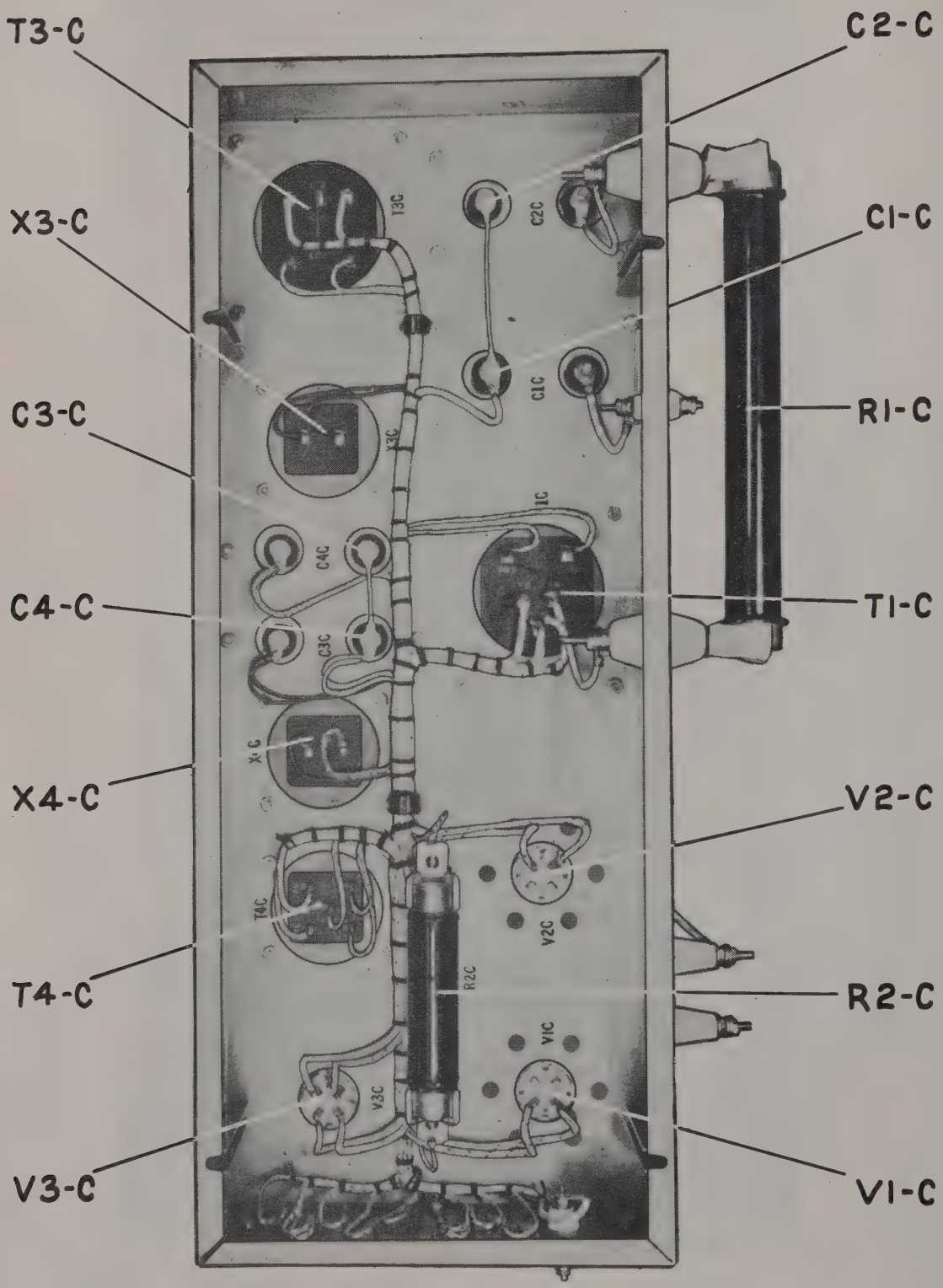


Fig. 7. 1600/400-Volt Power Supply—Bottom View

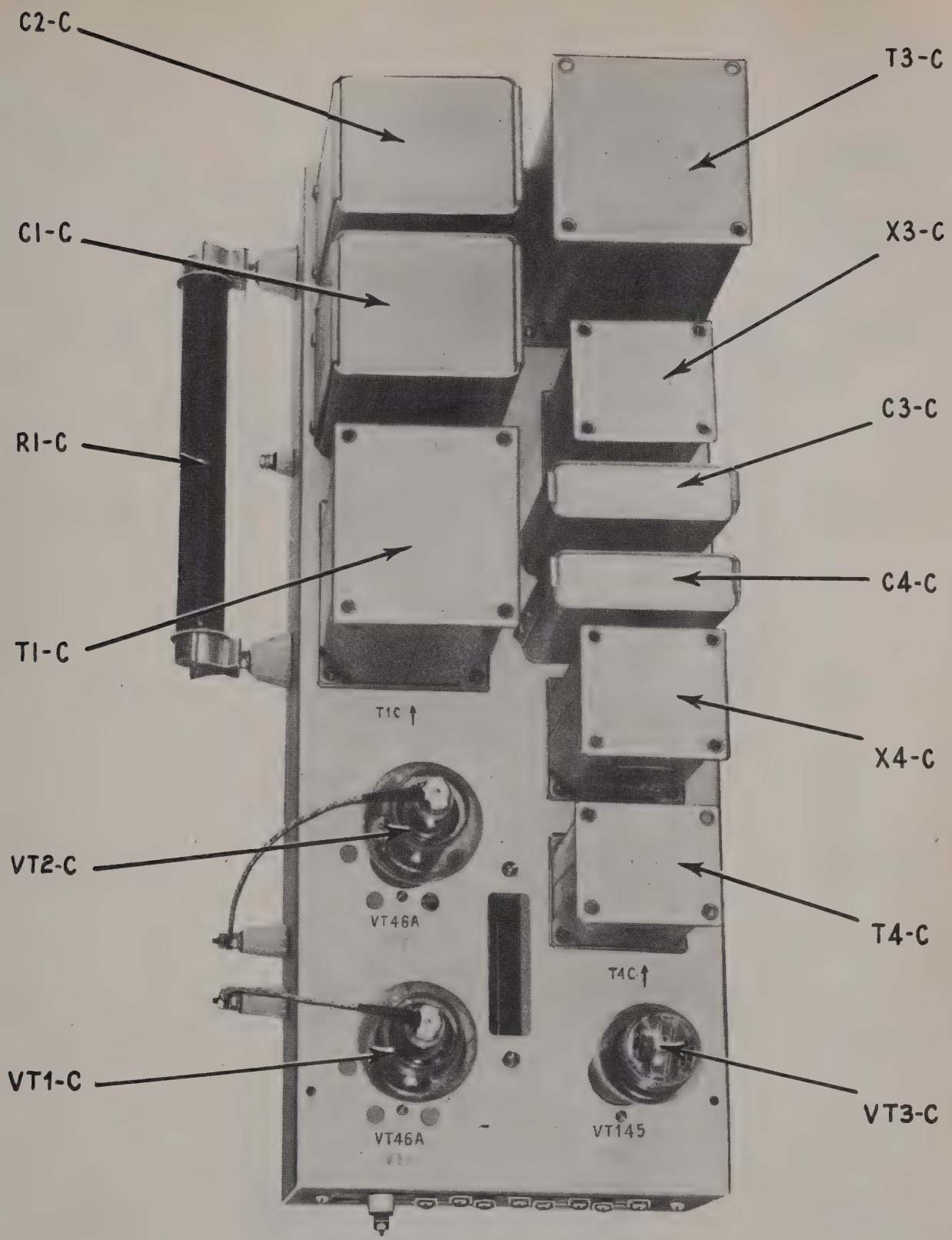


Fig. 8. 1600/400-Volt Power Supply—Top View

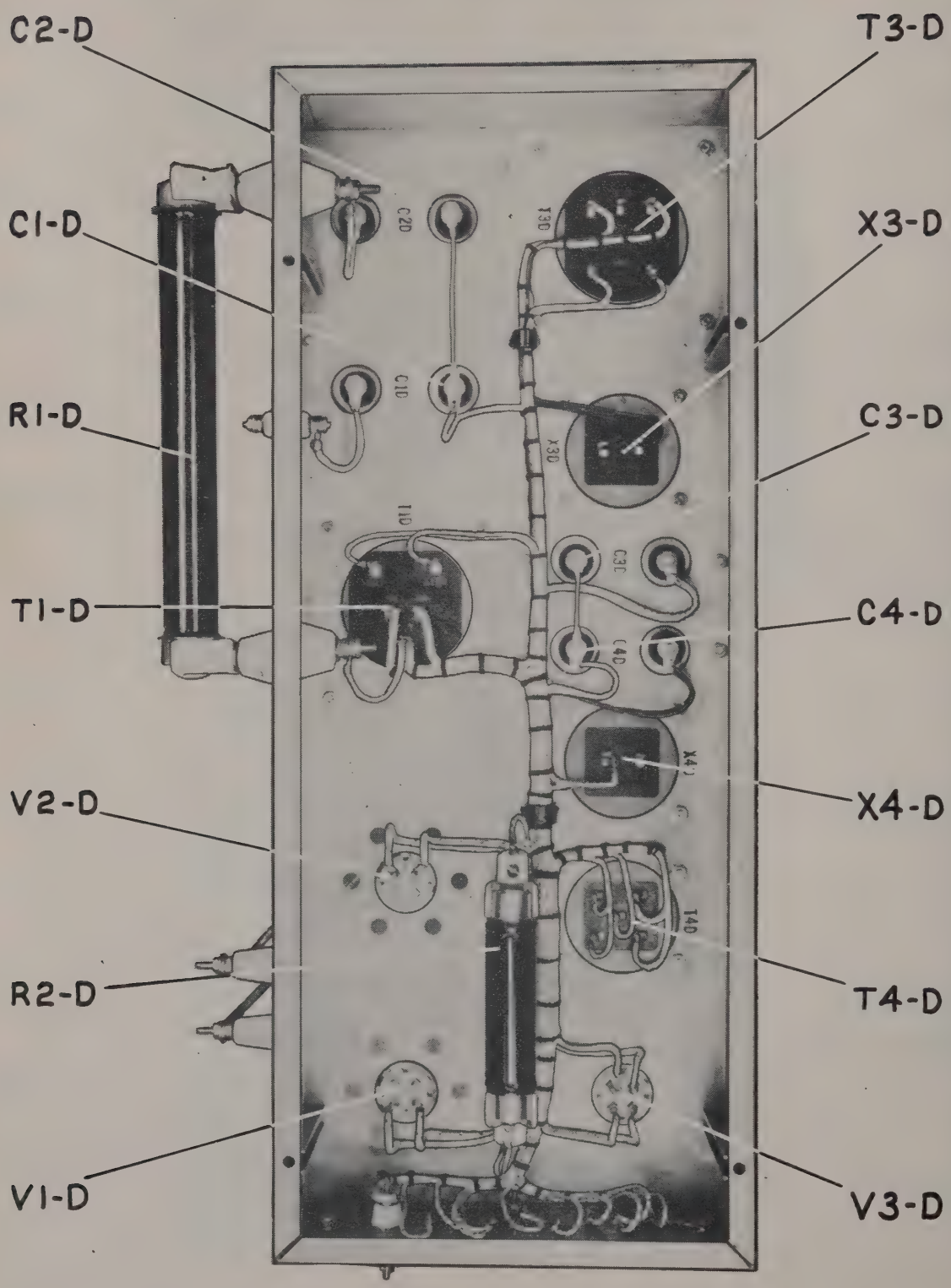


Fig. 9. 1500/350-Volt Power Supply—Bottom View

Remote

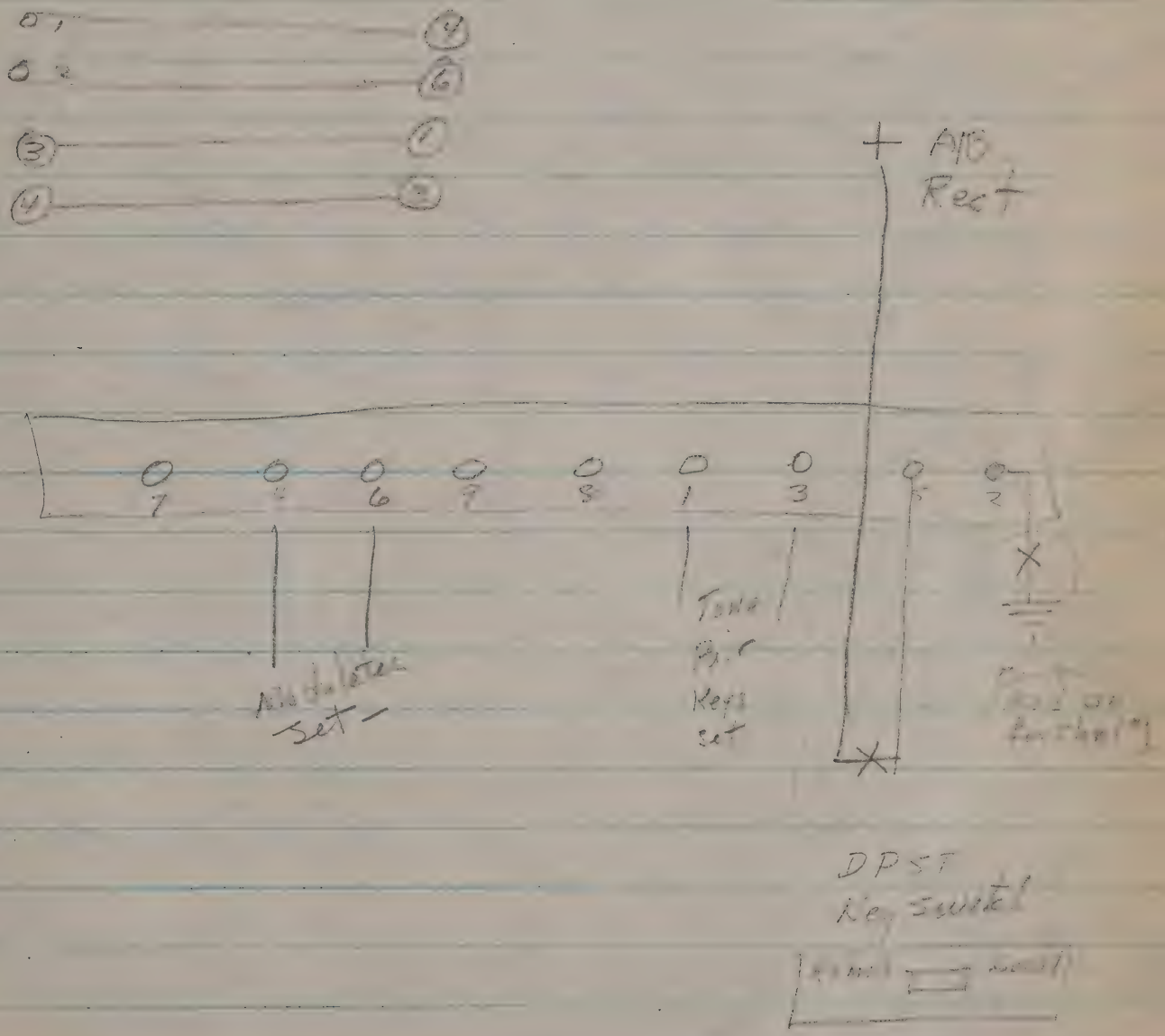
1 & 2 Modulation

3 & 4 Tone keyer

Xmtr

1 & 6 Modulation

1 & 3 TONE



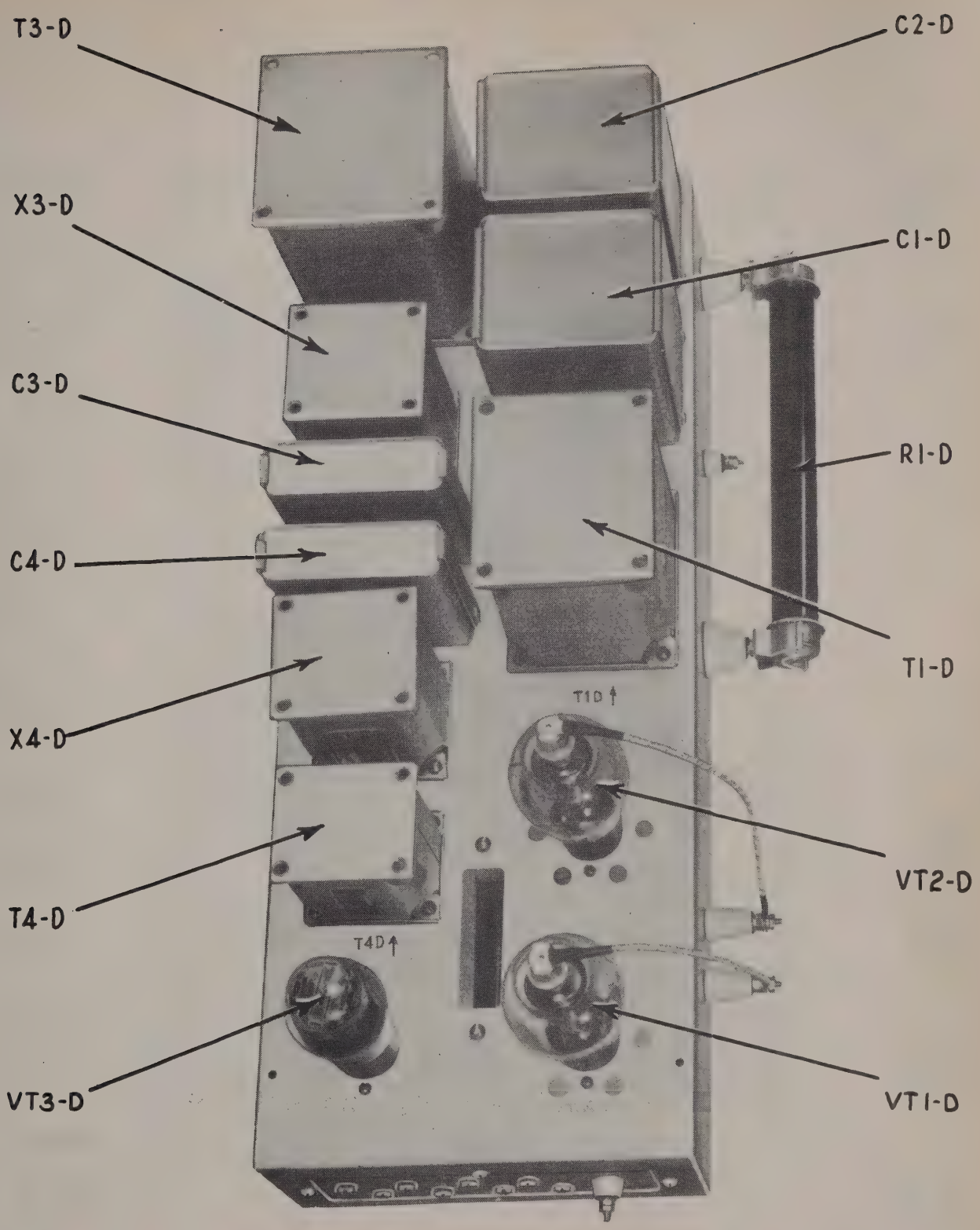


Fig. 10. 1500/350-Volt Power Supply—Top View

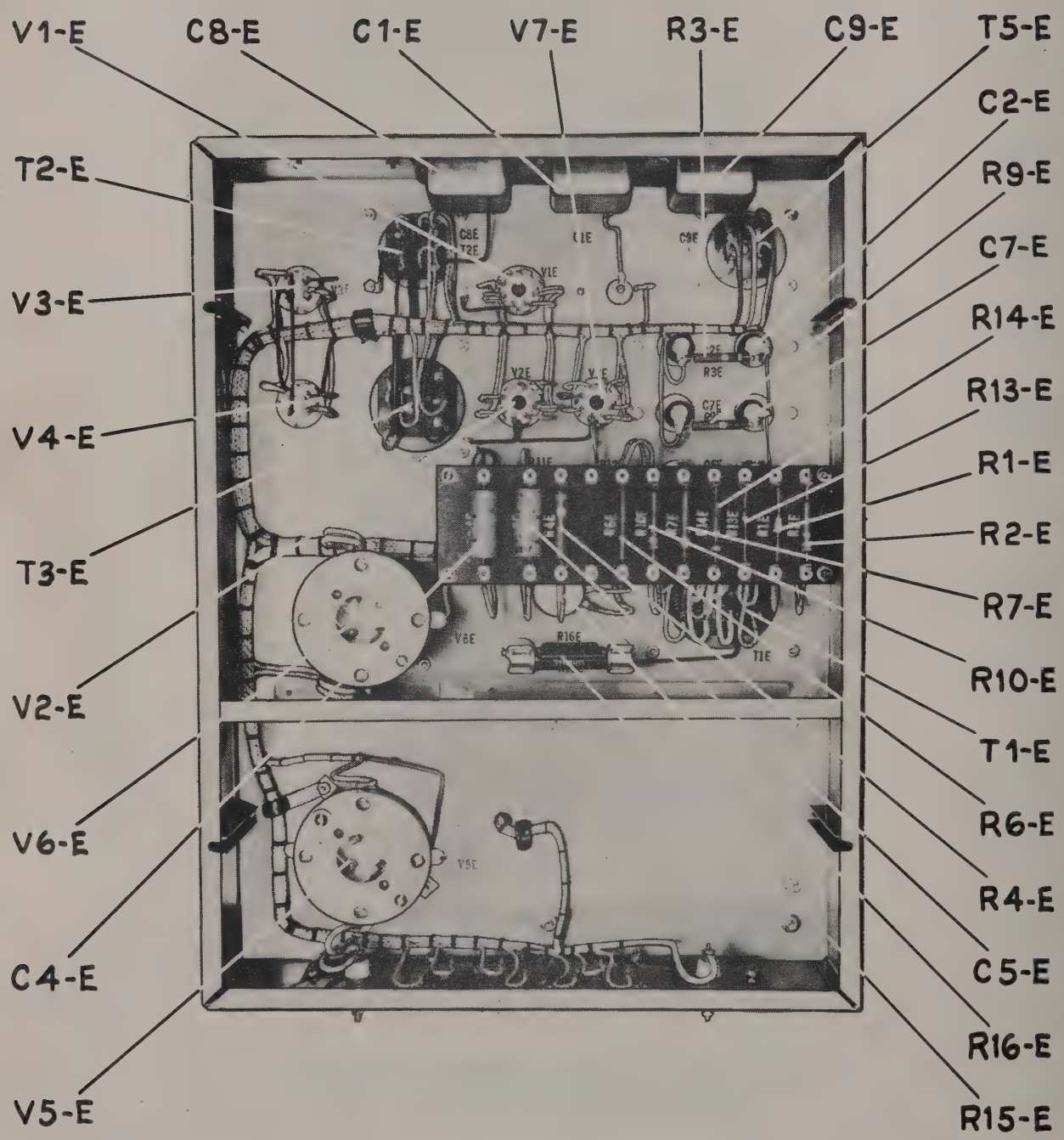


Fig. 11. Voice Amplifier and Modulator—Bottom View

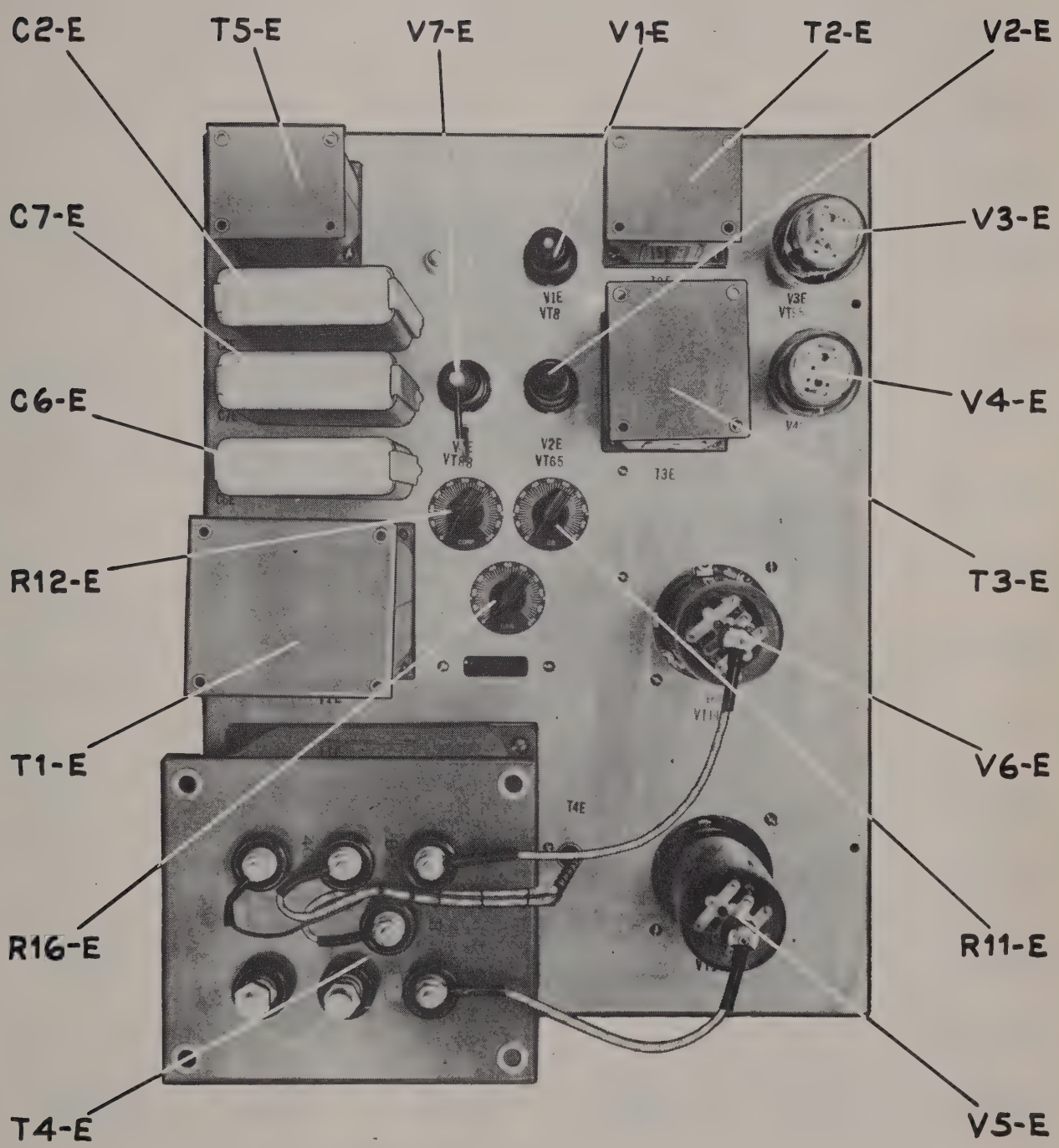


Fig. 12. Voice Amplifier and Modulator—Top View

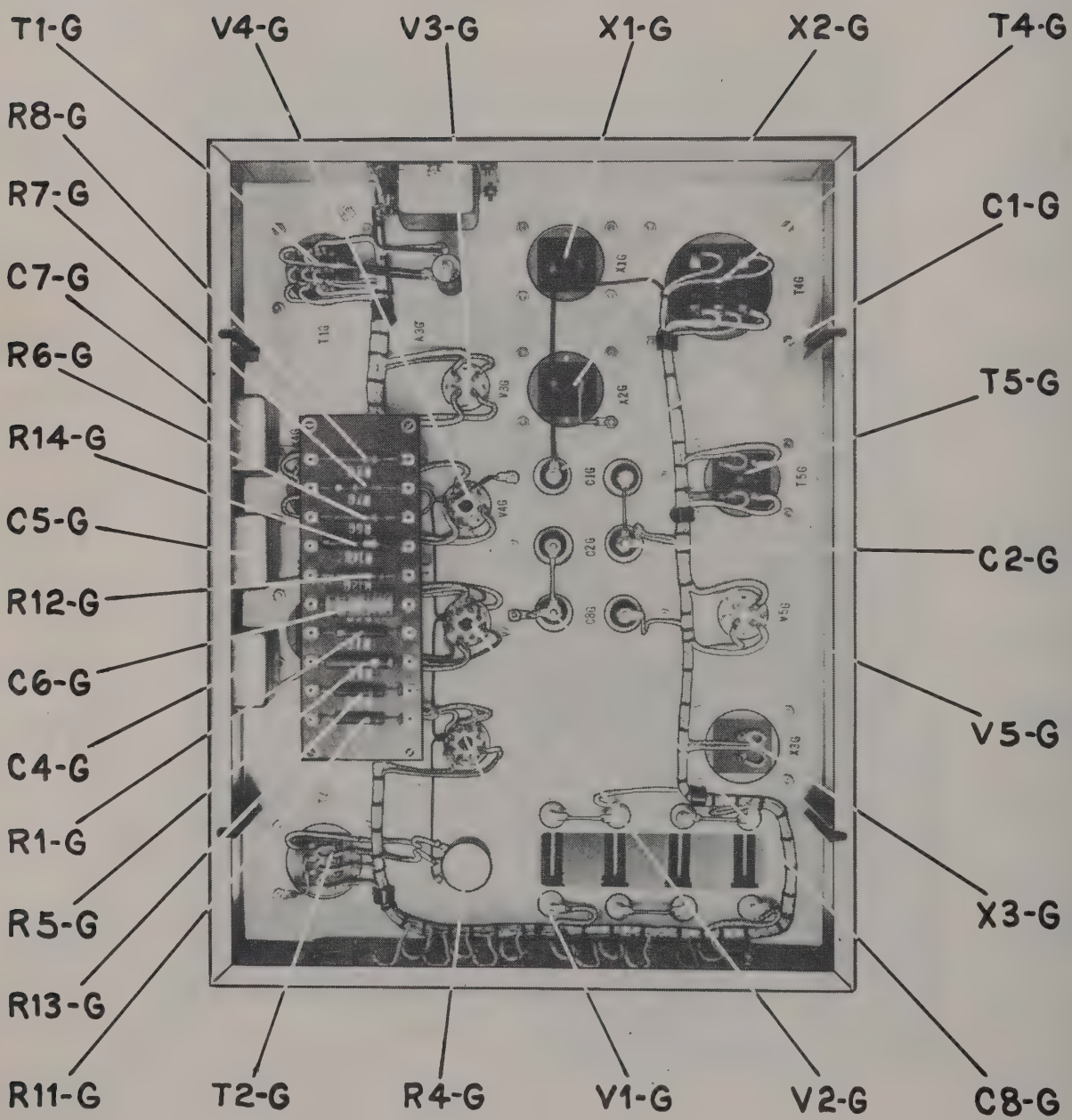


Fig. 13. Bias Supply and Keyer—Bottom View

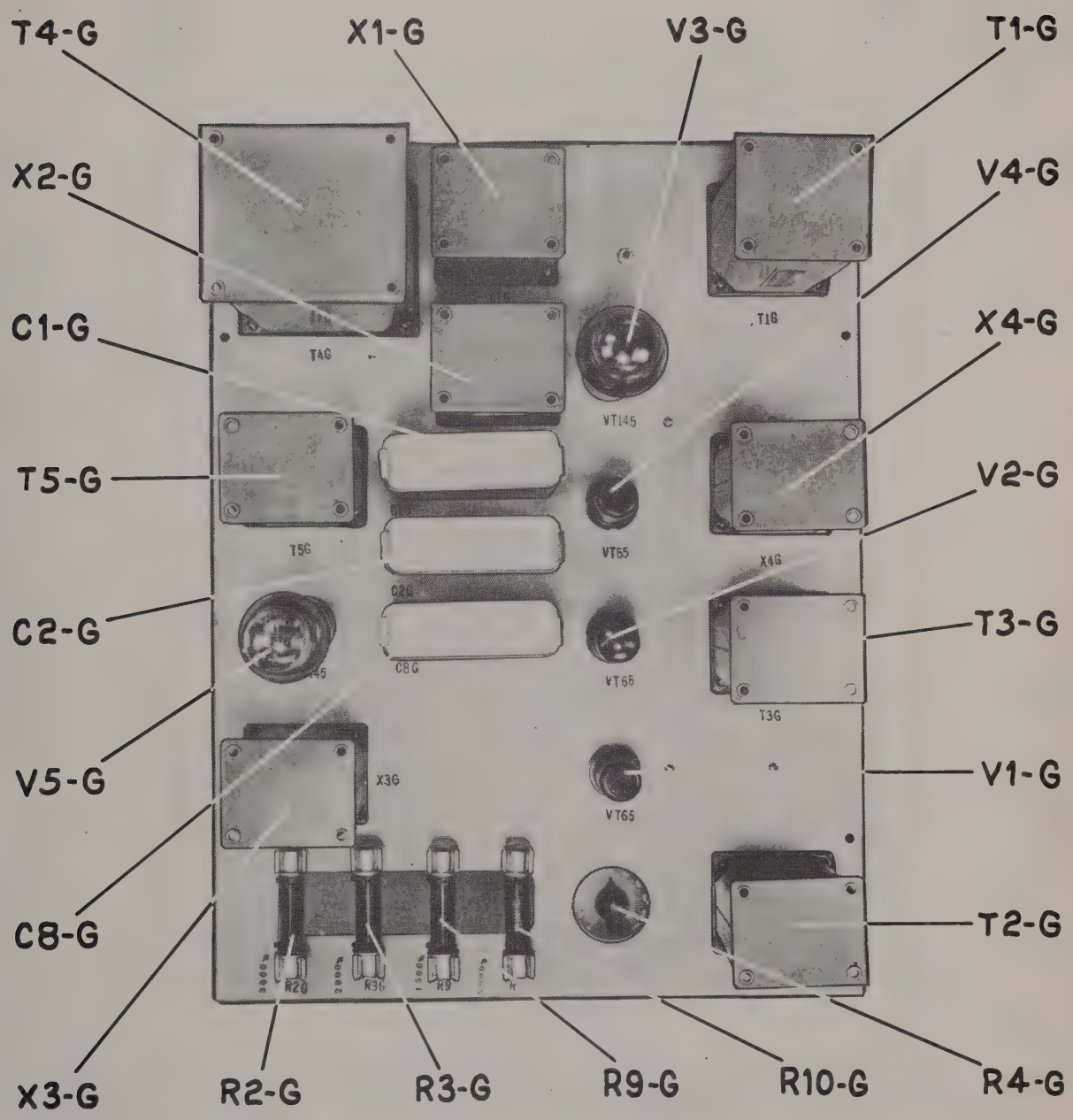


Fig. 14. Bias Supply and Keyer—Top View

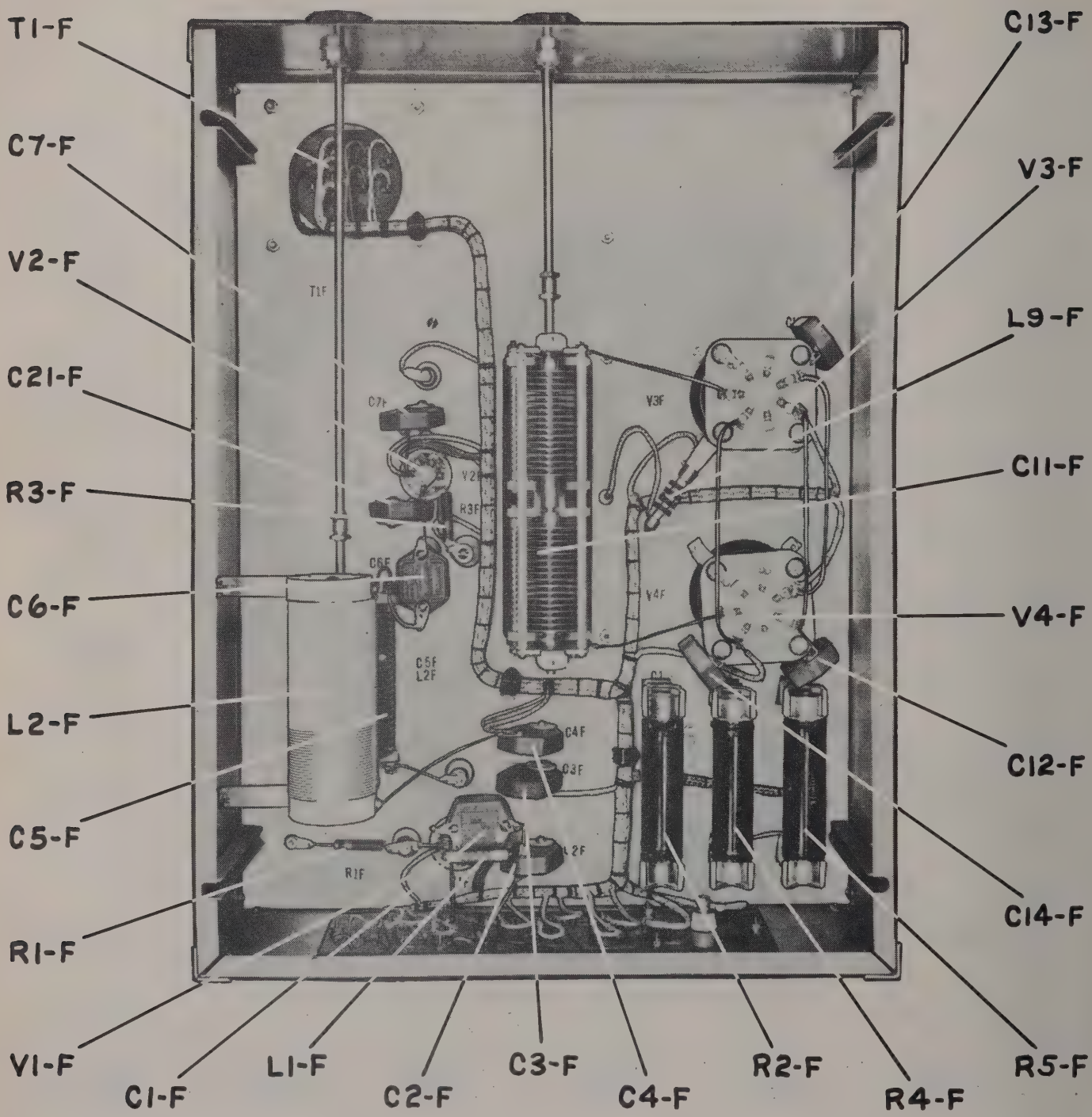


Fig. 15. Radio Frequency Unit—Bottom View

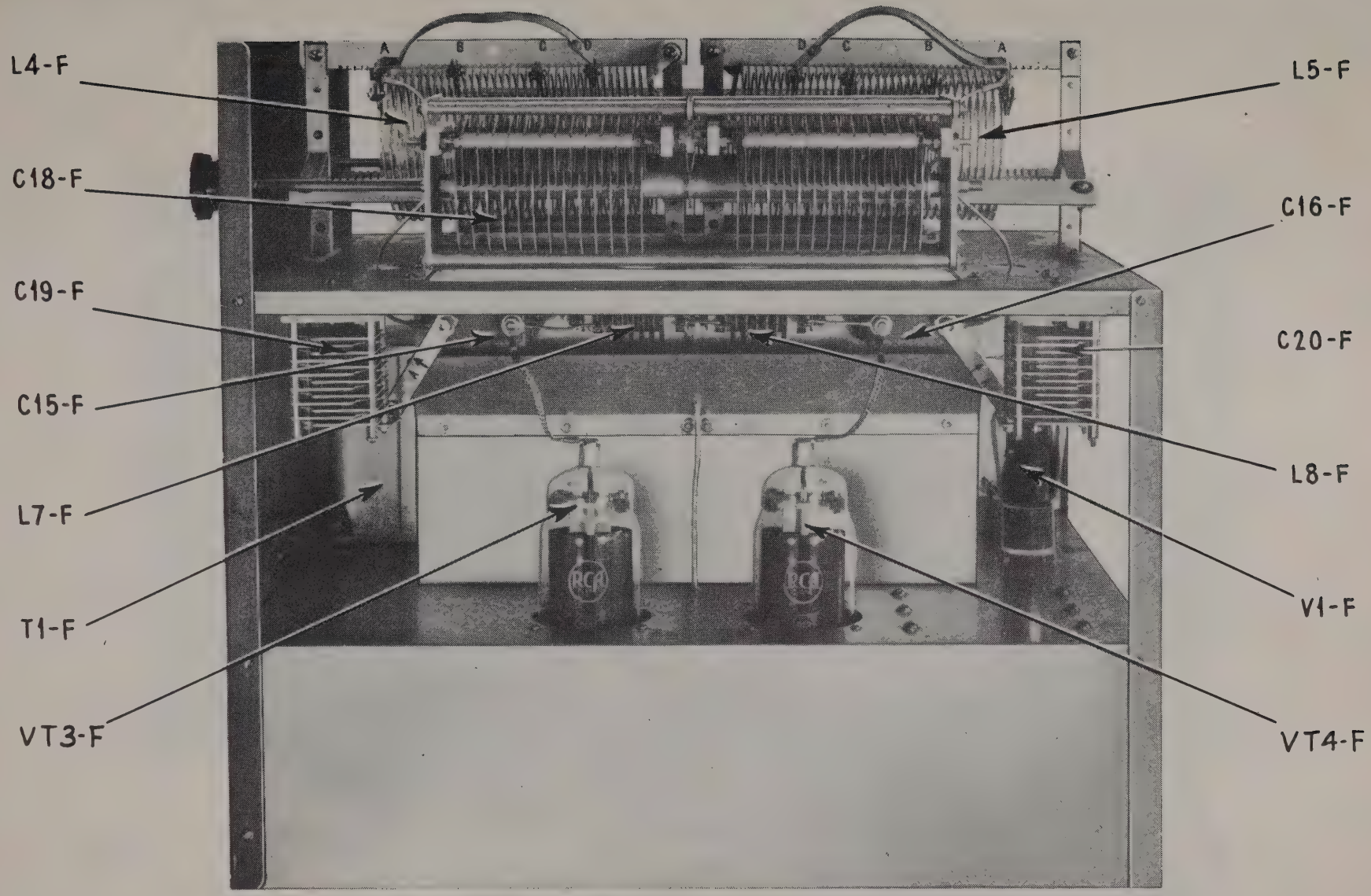


Fig. 16. Radio Frequency Unit—Right Side View

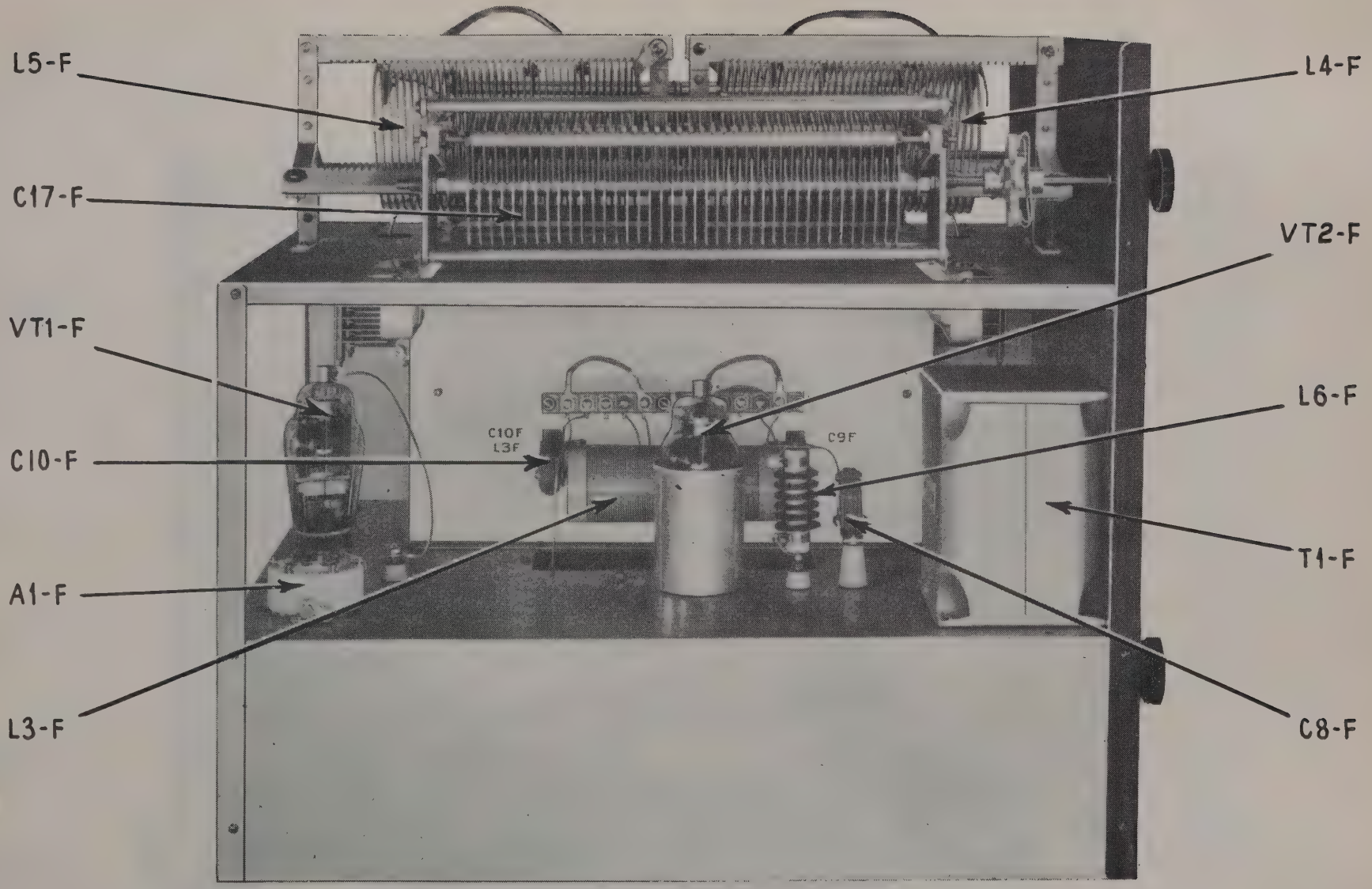


Fig. 17. Radio Frequency Unit—Left Side View

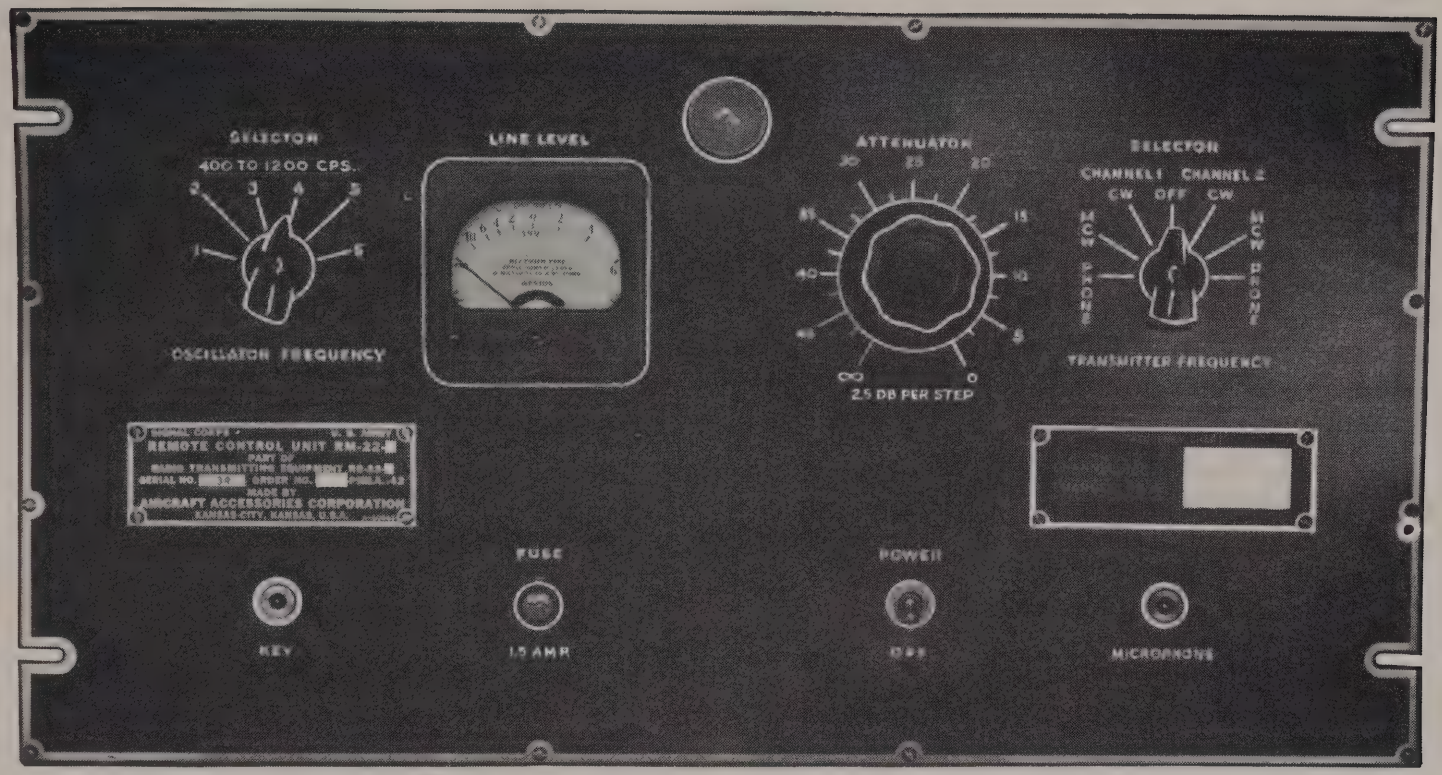


Fig. 18. Remote Control Unit RM-22-D—Front View

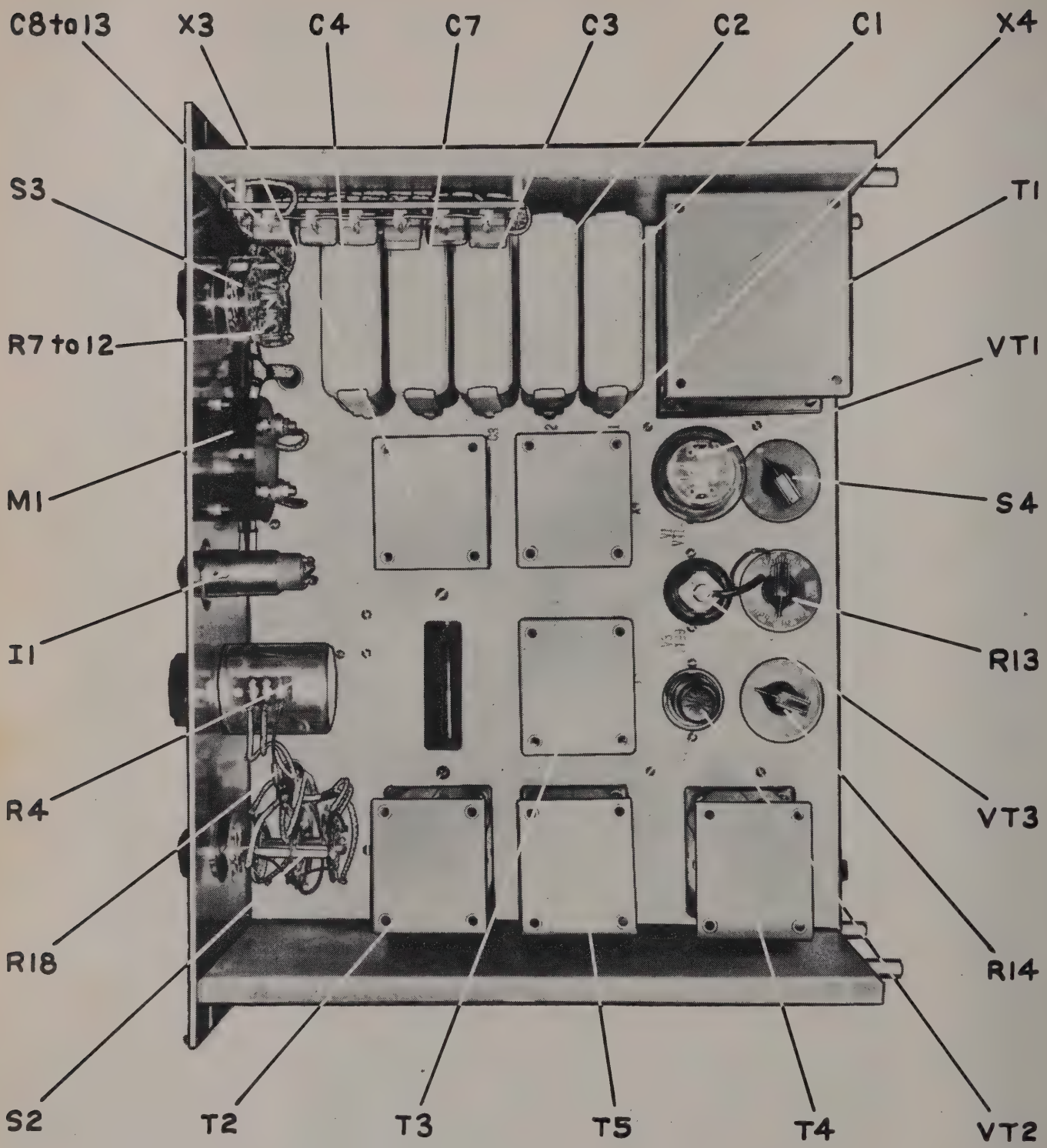


Fig. 19. Remote Control Unit RM-22-D—Top View

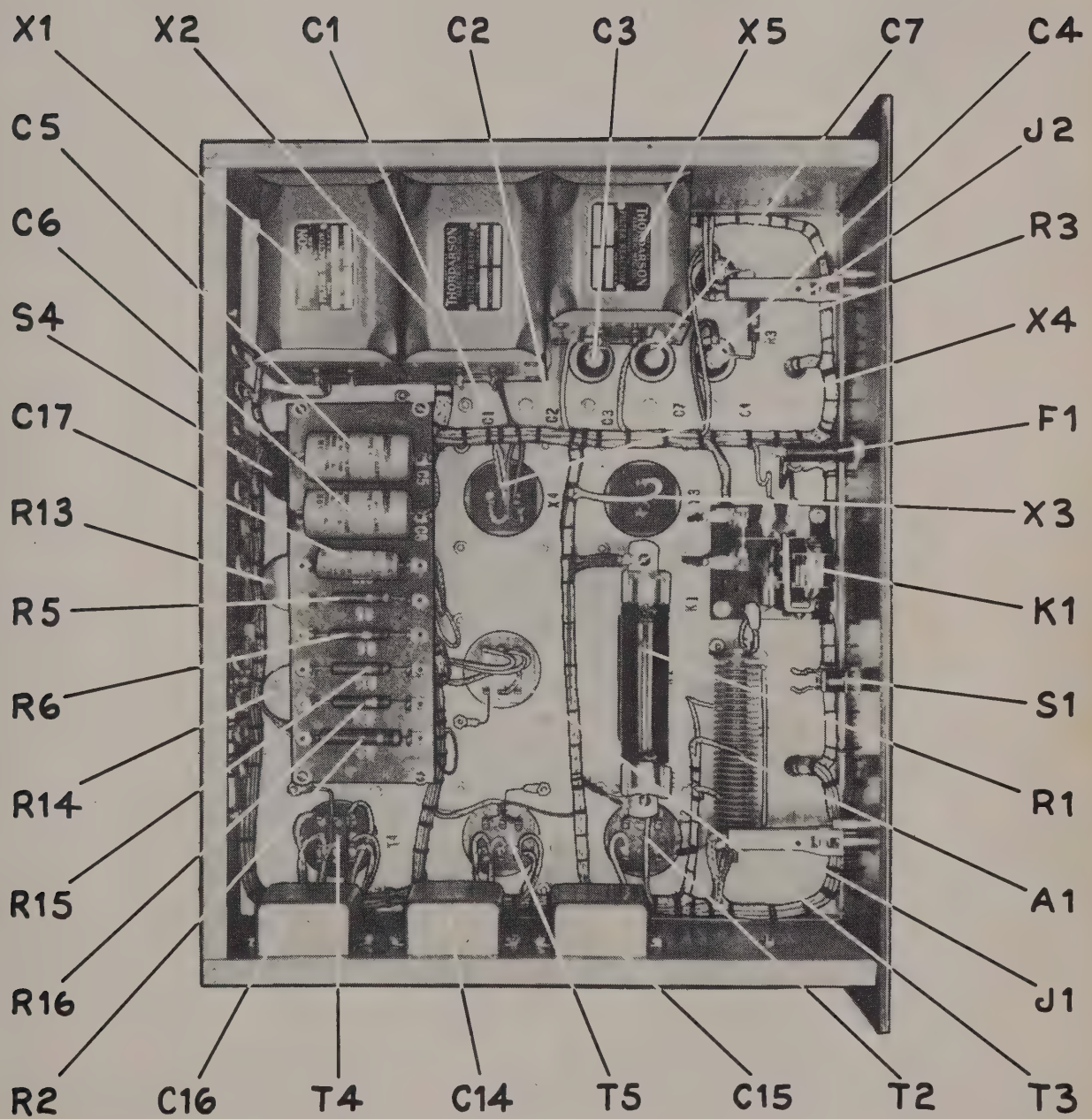


Fig. 20. Remote Control Unit RM-22-D—Bottom View

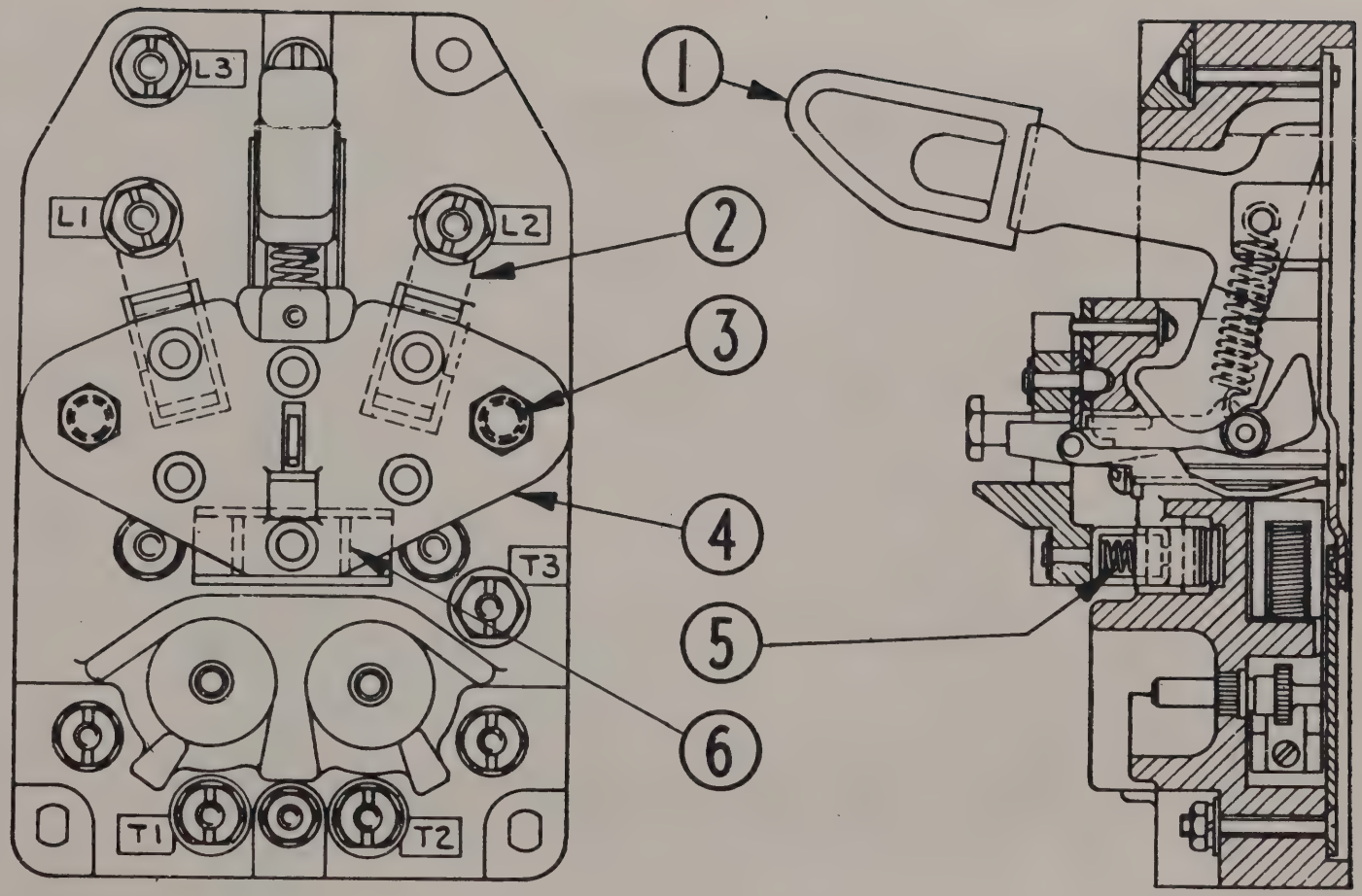


FIG. 21. CUTLER-HAMMER MAIN LINE SWITCH (S1-B)

CUTLER-HAMMER MAIN LINE SWITCH MATERIAL LIST (S1-B)

REF. NO.	MFR'S PART NO.	NO. REQ.	DESCRIPTION
1	53-12	1	Moulded Handle
2	4227-37	6	Contact Plate
3	69-49	2	Spring
4	81-209-3	1	Contact Board
5	969-633	3	Contact Spring
6	4221-5	3	Movable Contact

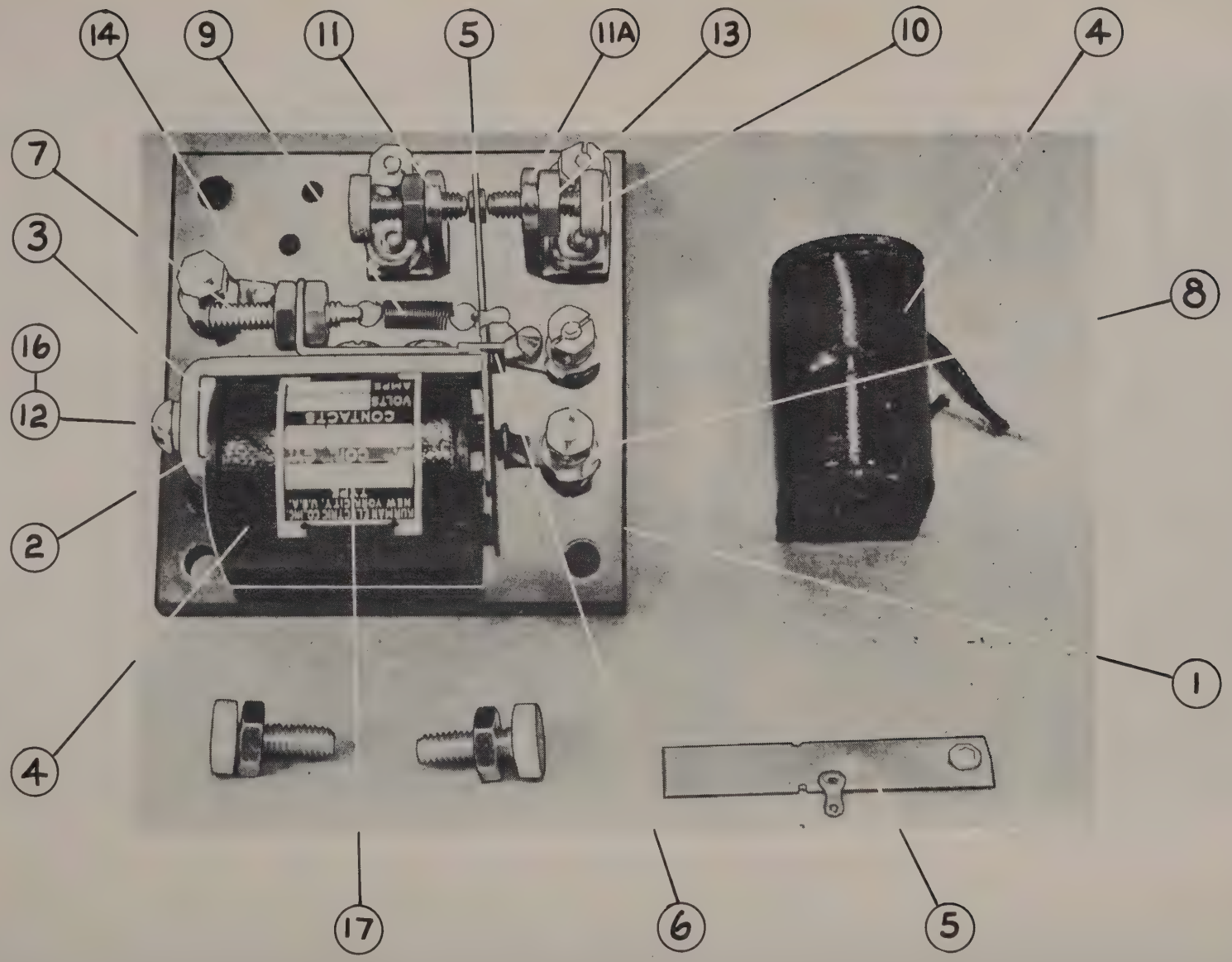


FIG. 22. KURMAN ELECTRIC COMPANY RELAY ASSEMBLY (K-1)

KURMAN ELECTRIC COMPANY RELAY MATERIAL LIST (K1)

REF. NO.	MFR'S DWG. NO.	NO. REQ.	DESCRIPTION
1	201A	1	Base—Bakelite-Navy App. ¼" Stock
2	102	1	Pole Piece—115 x $\frac{13}{32}$" Nickel Alloy
3	103-1	1	Pole Piece Bracket—$\frac{3}{32}$" Rd. Edge Brass-Ni-Plate
4	C-134	1	Coil Assembly
5		1	Armature Assembly
6	106	1	Armature Bracket—.040" Brass-Ni-Plate
7	107	1	Adjustment Bar—Brass-⅛" Sq. Stock
8		5	Terminal Cup Washer—No. 128
9	119A	1	Spring—.012" Ph. Bronze Spring Wire
10	112	2	Contact Screw
11	111	1	Left Contact Bracket
12		1	Screw—8-32 x ¼"
13		4	Nut—8-32 Hex.
14		2	Soldering Lug—Hot Tinned
15	115	5	Lock Nut—Brass-Nickel-Plate
16		1	Washer—Flat No. 8
17	124-A	1	Name Plate
18		1	Screw—2-56 x ⅛" R.H.
19	219	1	Connector—Brass C.P.
11A	111A	1	Right Contact Bracket
20		1	Washer—Flat-No. 2

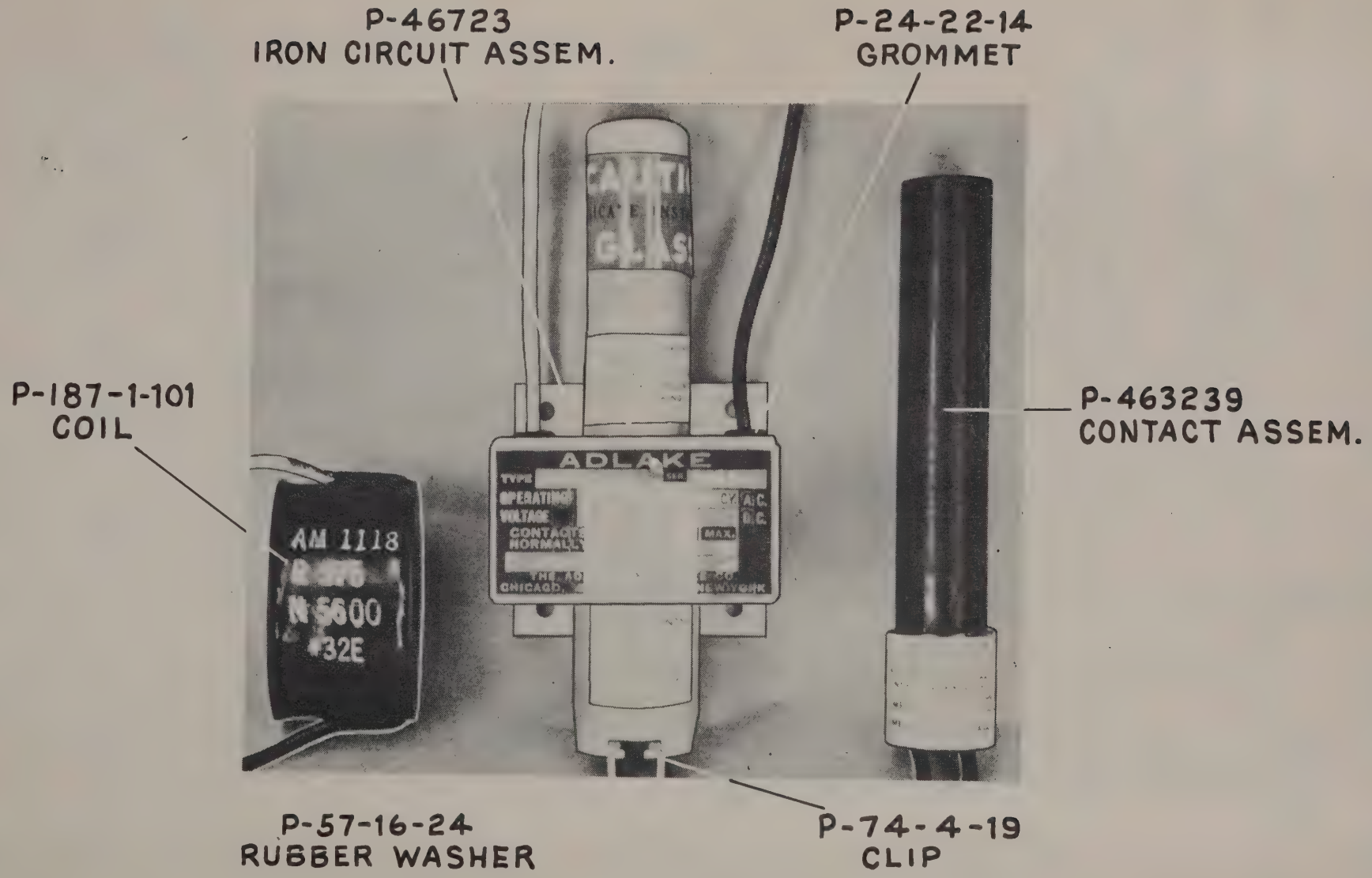


FIG. 23. ADAMS AND WESTLAKE COMPANY RELAY ASSEMBLY (K5-B)

ADAMS AND WESTLAKE COMPANY RELAY ASSEMBLY (K5-B)

MFR'S PART NO.	NO. REQ.	DESCRIPTION
P-46723	1	Iron Circuit Assembly
P-24-22-14	2	Rubber Grommet
P-463239	1	Contact Assembly
P-74-4-19	1	Retaining Clip
P-57-16-24	2	Rubber Washer
P-187-1-101	1	Coil

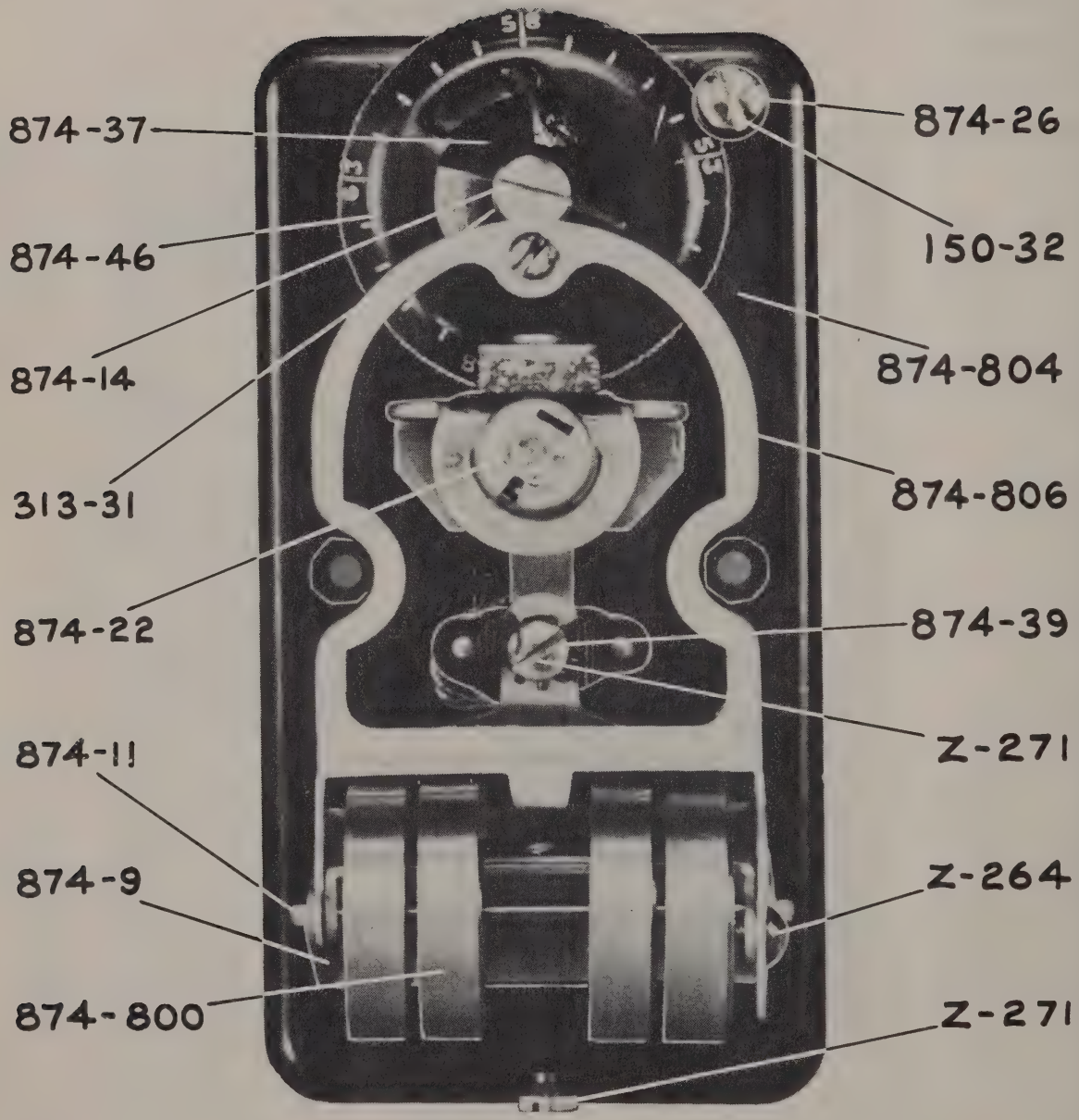


FIG. 24. PENN ELECTRIC SWITCH COMPANY THERMOSTAT ASSEMBLY (A2-A)

PENN ELECTRIC SWITCH COMPANY THERMOSTAT MATERIAL LIST (A2-A)

MFR'S PART NO.	NO. REQ.	DESCRIPTION
150-32	1	Dial Lock Screw
313-31	1	Dial Spring
620-123	2	Terminal Screws (Not Illustrated)
874-9	1	Mounting Bracket for Supporting Bimetal
874-11	1	Bearing Pin for Bimetal
874-14	1	Dial Pivot Screw
874-19	1	Cam Follower Spring (Not Illustrated)
874-22	1	Cycle-ator
874-23	1	Mounting Plate (Not Illustrated)
874-26	1	Washer for Dial Lock
874-37	1	Cam for Dial
874-38	1	Thermostat Cover (Not Illustrated)
874-39	1	Shakeproof Lockwasher for Contact Arm Assem.
874-46	1	Dial
874-800	1	Bimetal and Mounting Bracket
874-804	1	Base Assembly which includes, Base, Contact Assembly, Magnet and Bracket Assembly less Cycle-ator, Terminal Screws, Cover Screw, and Dial Lock Assembly
874-806	1	Cam Follower Assembly
Z-264	1	Cam Follower Assembly Screw
Z-271	1	Contact Arm Assembly Screw
Z-271	1	Cover Screw
Z-649	2	Mounting Bracket Screw (Not Illustrated)

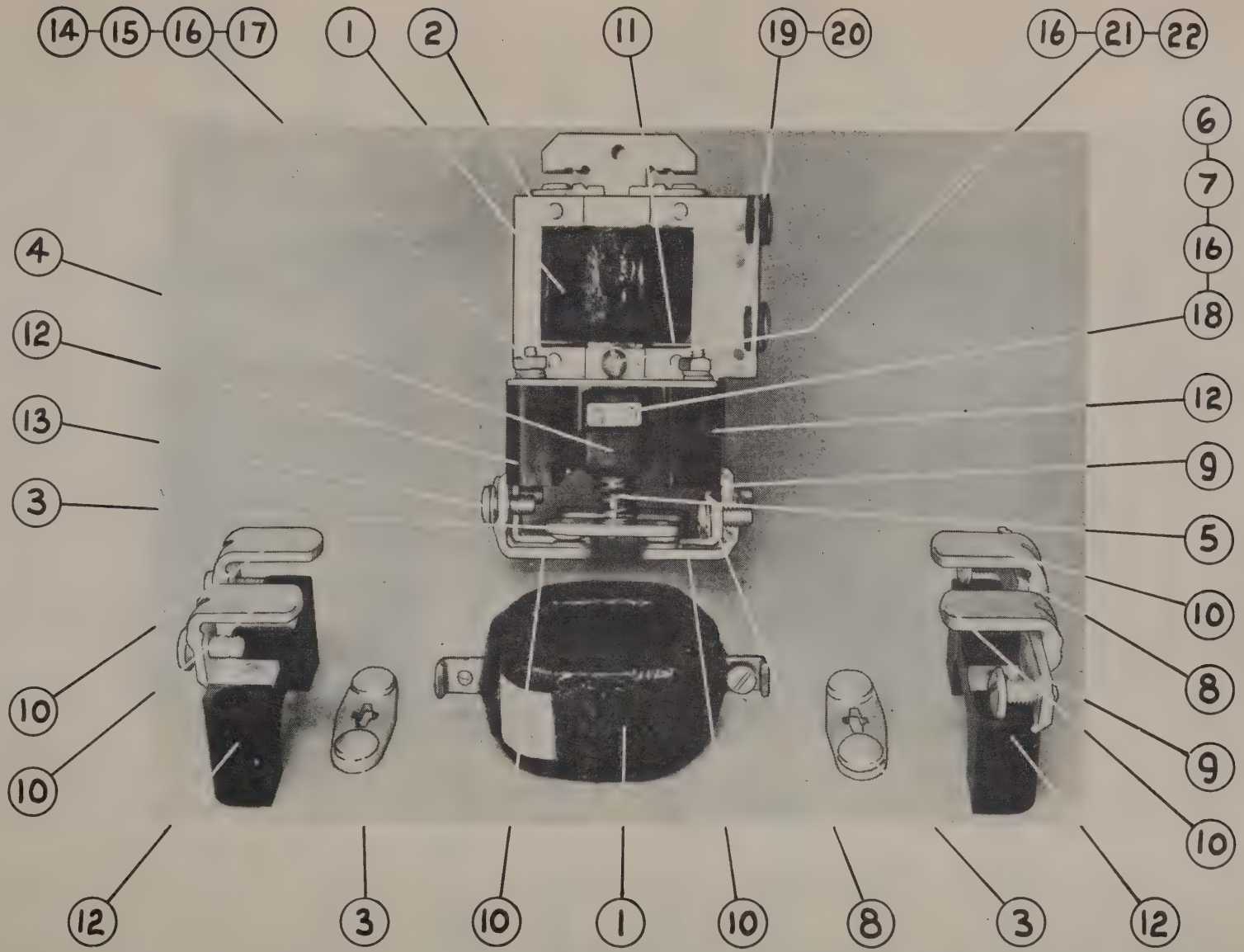
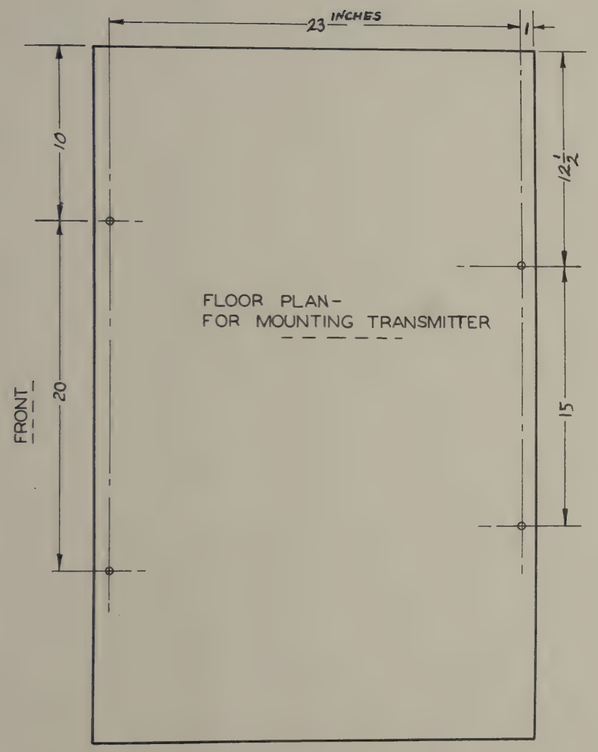
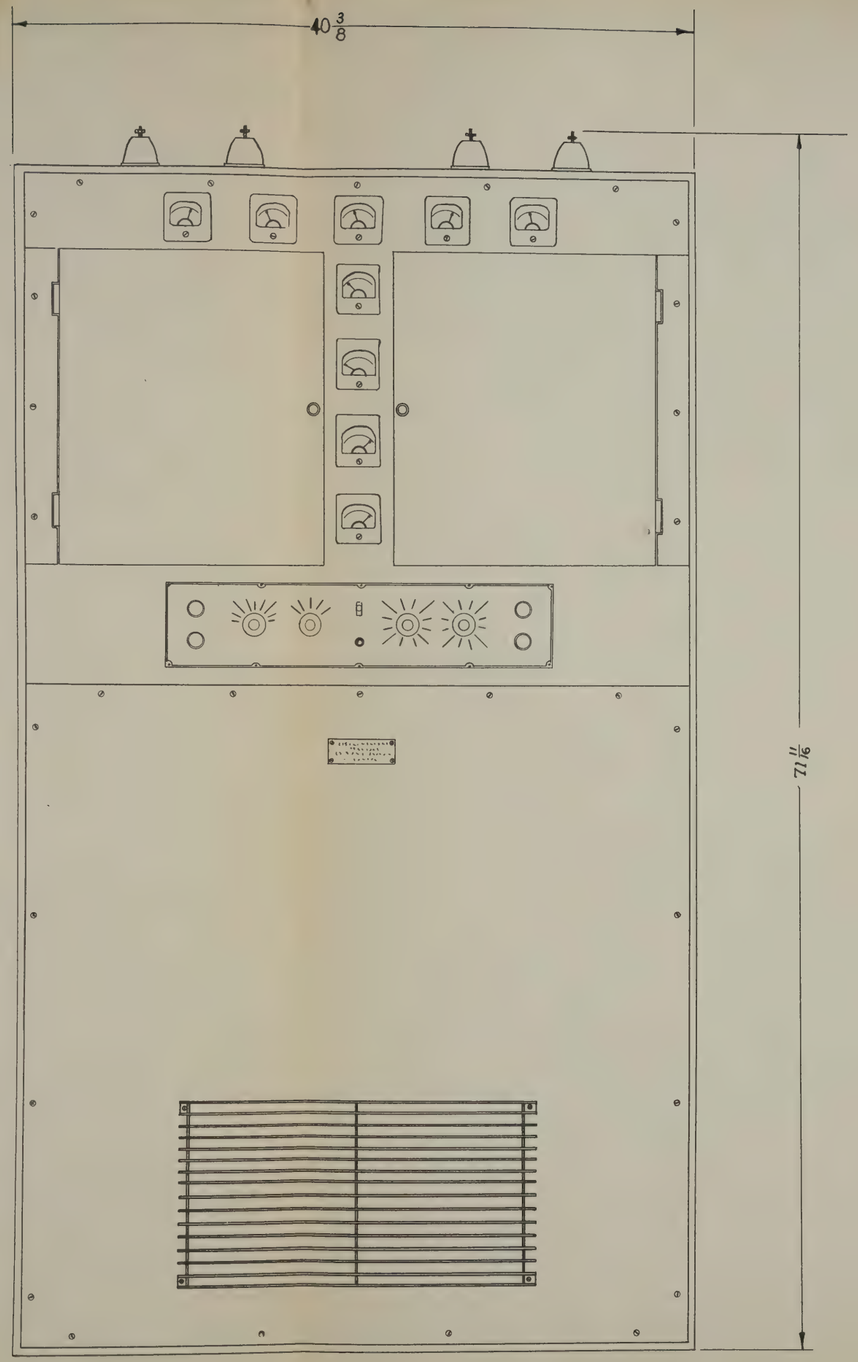


FIG. 25. ALLEN-BRADLEY COMPANY RELAY ASSEMBLY (K4-B, K8-B)

ALLEN-BRADLEY COMPANY RELAY MATERIAL LIST (K4-B, K8-B)

REF. NO.	MFR'S PART NO.	NO. REQ.	DESCRIPTION
1	RA-33981	1	Coil
2	X-43250	1	No. 2 Solenoid
3	X-33552	2	Contact
4	X-33480	2	Cross Bar
5	B-7615	2	Spring
6	E-8006	1	Plate
7	E-7902	1	Locking Plate
8	E-8465	1	No. 1 Terminal Plate, Left Hand
9	E-8463	1	No. 2 Terminal Plate, Right Hand
10	X-52549	4	Terminal
11	E-8672	1	Coil Clamp
12	F-10644	2	Terminal Block
13	M-1552	4	Terminal Screw
14	M-1153	4	6-32 x ¾" Right Hand Screw
15	M-990	4	6-32 Iron Nut
16	M-1090	7	No. 6 Spring Washer
17	M-1260	4	$\frac{5}{32}$" x $\frac{9}{32}$" Washer
18	M-1174	2	6-32 x 1⅛" Right Hand Iron Screw
19	M-1304	4	Tubular Rivet
20	F-10723	4	Rubber Grommet
21	M-971	1	6-32 x ⅝" Right Hand Iron Machine Screw
22	M-1384	1	Iron Washer





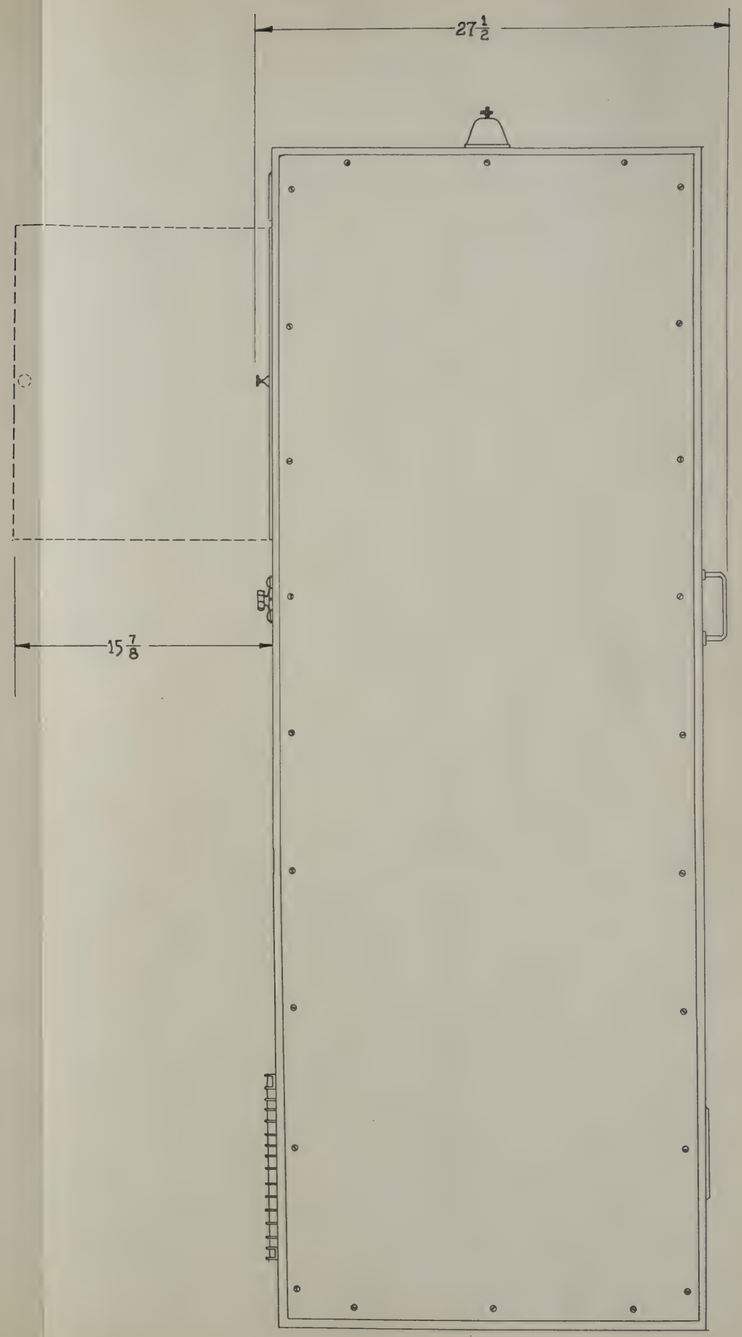


FIG. 26. RADIO TRANSMITTER BC-452-D—OUTLINE DRAWING

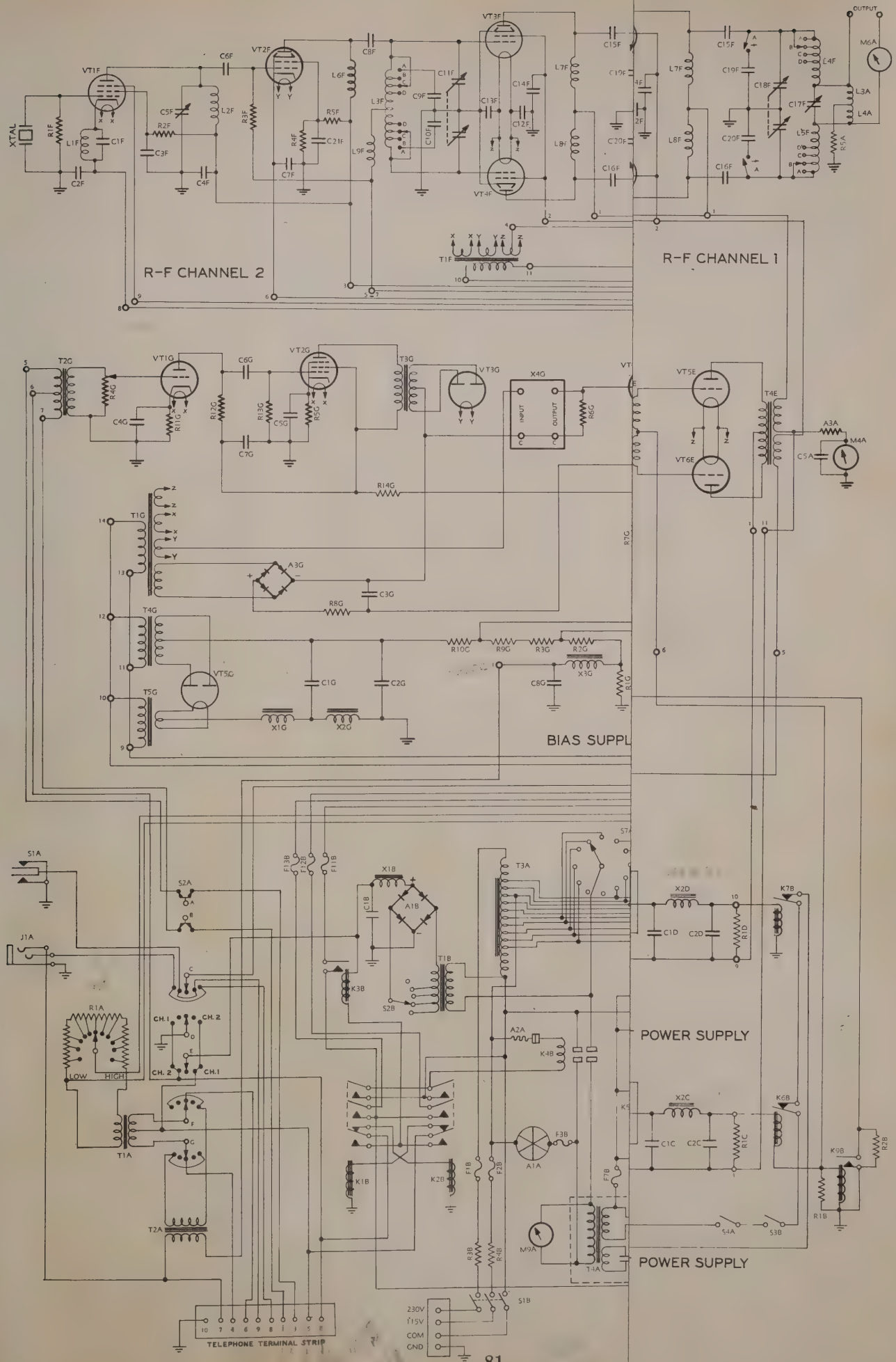


FIG. 27. RADIO TRANSMITTER BC-452-D—SCHEMATIC DIAGRAM

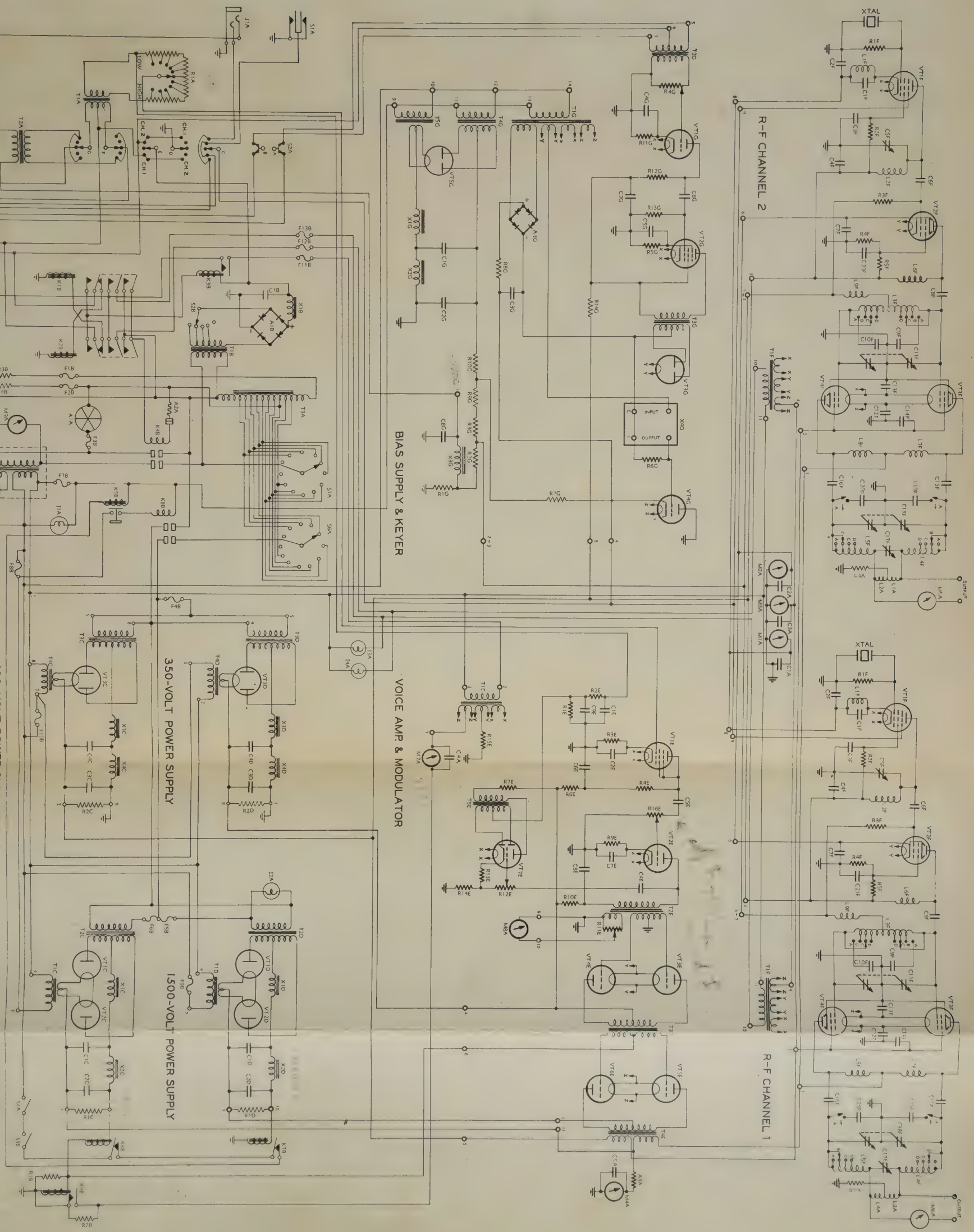


FIG. 27. RADIO TRANSMITTER BC-452-D—SCHEMATIC DIAGRAM

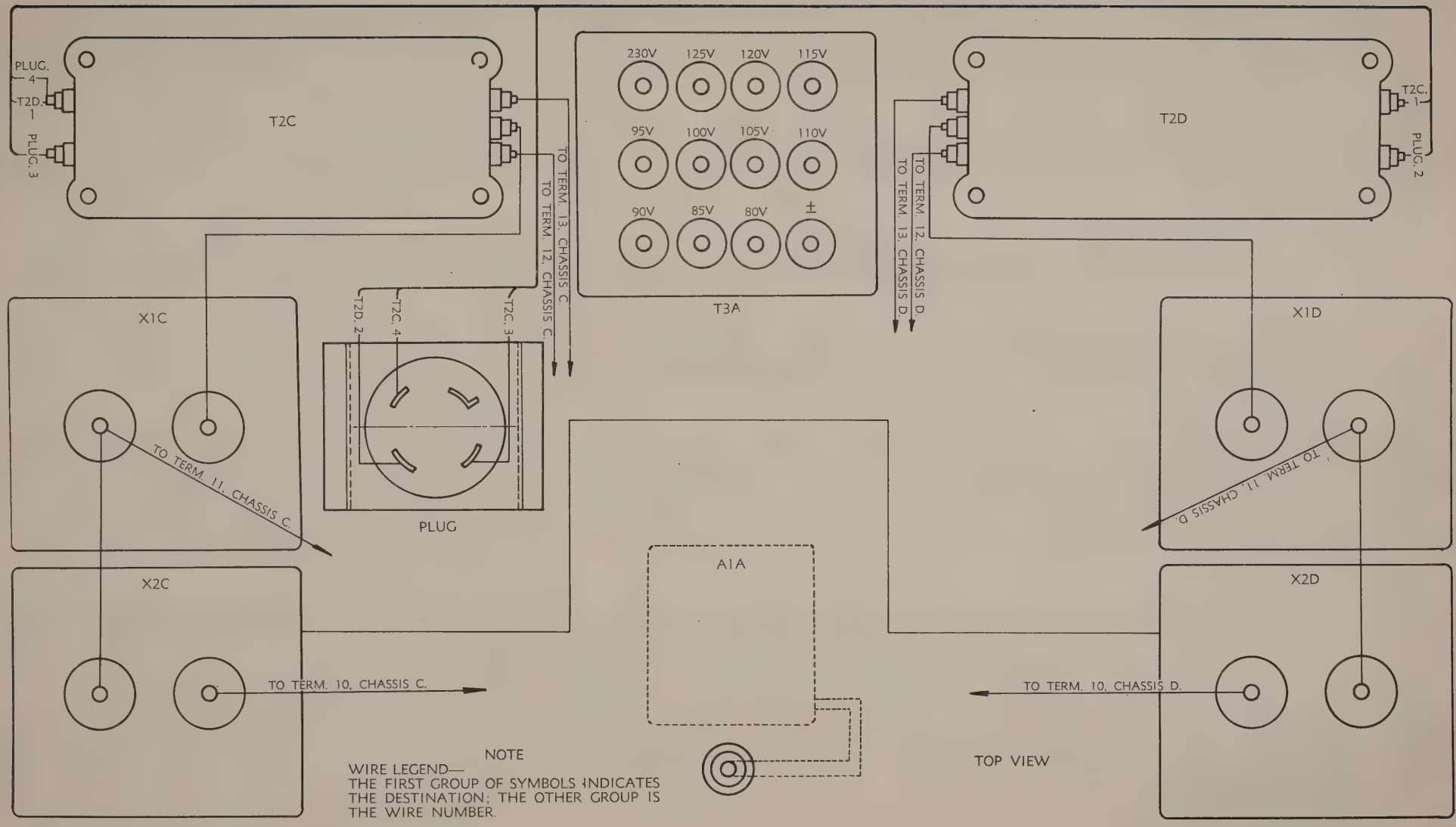


FIG. 28. TRANSFORMER TRUCK CONNECTION DIAGRAM

WIRING CHART FOR TRANSFORMER TRUCK—RC-52-D

Wire No.	From	To	Description		Length	Remarks
			Wire Size	Insulation		
1	T2-C	T2-D	12	1000V	51	WH-YL-BN-BK
2	T2-D	Plug	12	1000V	48	WH-OR-YL-BN
3	T2-C	Plug	12	1000V	36	WH-YL-GN-BK
4	T2-C	Plug	12	1000V	36	WH-YL-BN-BK

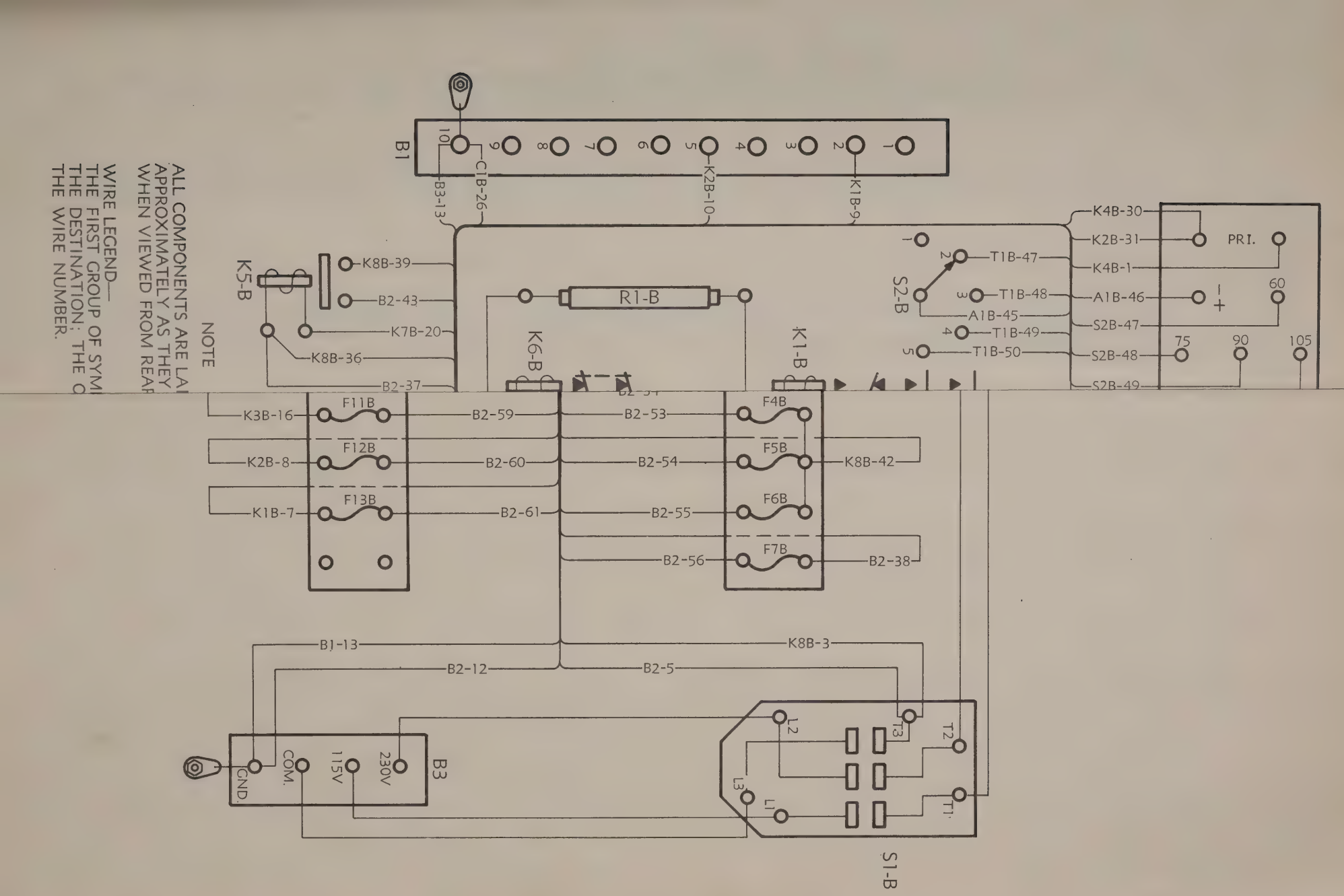
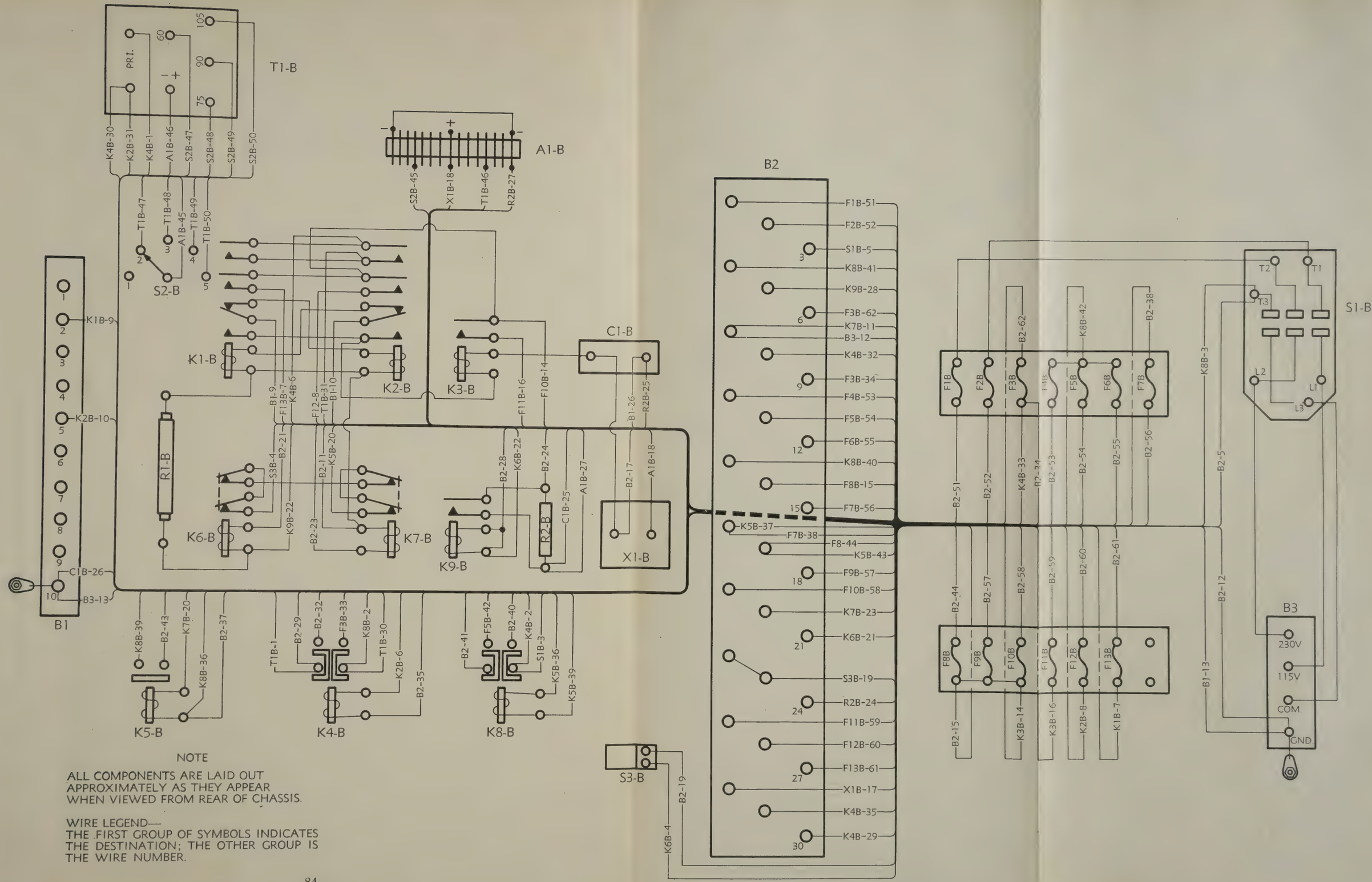


FIG. 29. RELAY AND FUSE PANEL CONNECTION DIAGRAM



NOTE

ALL COMPONENTS ARE LAID OUT APPROXIMATELY AS THEY APPEAR WHEN VIEWED FROM REAR OF CHASSIS.

WIRE LEGEND—
THE FIRST GROUP OF SYMBOLS INDICATES THE DESTINATION; THE OTHER GROUP IS THE WIRE NUMBER.

FIG. 29. RELAY AND FUSE PANEL CONNECTION DIAGRAM

WIRING CHART FOR RELAY AND FUSE PANEL—RC-52-D

Wire No.	From	To	Description		Length	Remarks
			Wire Size	Insulation		
1	K4-B	T1-B	20	1000V	18	WH-BK
2	K4-B	K8-B	10	1000V	10	WH-BK
3	K8-B	S1-B	10	1000V	26	WH-BK
4	K6-B	S3-B	20	1000V	40	RD
5	B2-3	S1-B	10	1000V	20	WH-BK
6	K2-B	K4-B	20	1000V	30	WH-OR
7	K1-B	F13-B	20	1000V	36	WH-OR-BL
8	K2-B	F12-B	20	1000V	36	WH-RD-BK
9	B1-2	K1-B	20	1000V	40	BL
10	B1-5	K2-B	20	1000V	37	BL
11	B2-7	K7-B	20	1000V	30	WH-RD-BL
12	B2-7	B3-GND	14	1000V	23	WH-OR-BL
13	B1-10	B3-GND	14	1000V	44	WH-OR-BL
14	K3-B	F10-B	14	1000V	28	WH-RD-GN
15	B2-14	F8-B	14	1000V	12	WH-RD-GN
16	K3-B	F11-B	20	1000V	33	BN
17	B2-28	X1-B	20	1000V	23	WH-RD
18	A1-B	X1-B	20	1000V	18	WH-RD
19	B2-23	S3-B	20	1000V	20	RD
20	K5-B	K7-B	20	1000V	30	RD
21	B2-21	K6-B	20	1000V	26	OR
22	K6-B	K9-B	20	1000V	12	WH-GN
23	B2-20	K7-B	20	1000V	26	YL
24	B2-24	R2-B	20	1000V	20	GN
25	C1-B	R2-B	20	1000V	8	WH-RD-BL
26	B1-10	C1-B	20	1000V	27	WH-RD-BL
27	A1-B	R2-B	20	1000V	13	WH-RD-BL
28	B2-5	K9-B	20	1000V	27	WH-GN
29	B2-30	K4-B	10	1000V	32	WH
30	K4-B	T1-B	20	1000V	19	WH-BK
31	K2-B	T1-B	20	1000V	40	WH-BK
32	B2-8	K4-B	14	1000V	26	WH-RD-GN-BN
33	K4-B	F3-B	14	1000V	25	WH-GN-BL-BK
34	B2-9	F3-B	14	1000V	11	WH-YL-GN-BL
35	B2-29	K4-B	20	1000V	37	WH-OR
36	K5-B	K8-B	20	1000V	20	WH-RD-GN
37	B2-16	K5-B	20	1000V	34	WH-OR-GN
38	B2-16	F7-B	20	1000V	20	WH-OR-GN
39	K5-B	K8-B	20	1000V	24	WH-RD-YL
40	B2-13	K8-B	10	1000V	18	WH-BK
41	B2-4	K8-B	14	1000V	26	WH-GN-BL-BK
42	K8-B	F5-B	14	1000V	26	WH-GN-BL-BK
43	B2-17	K5-B	20	1000V	32	WH-YL-BN
44	B2-17	F8-B	20	1000V	10	WH-YL-BN
45	A1-B	S2-B	20	1000V	40	WH-BN
46	T1-B	A1-B	20	1000V	40	WH-BN
47	T1-B	S2-B	20	1000V	10	WH-BN
48	T1-B	S2-B	20	1000V	10	WH-BN
49	T1-B	S2-B	20	1000V	12	WH-BN
50	T1-B	S2-B	20	1000V	14	WH-BN
51	B2-1	F1-B	12	1000V	15	WH-OR-YL-GN
52	B2-2	F2-B	10	1000V	15	WH
53	B2-10	F4-B	14	1000V	14	WH-RD-GN-BN
54	B2-11	F5-B	14	1000V	14	WH-OR-GN-BL
55	B2-12	F6-B	14	1000V	14	WH-YL-BL-BK
56	B2-15	F7-B	20	1000V	14	WH-YL
57	B2-18	F9-B	20	1000V	10	WH
58	B2-19	F10-B	20	1000V	14	WH-GN-BN
59	B2-25	F11-B	20	1000V	18	BN
60	B2-26	F12-B	20	1000V	19	WH-RD-BK
61	B2-27	F13-B	20	1000V	19	WH-OR-BL
62	B2-6	F3-B	14	1000V	18	WH-YL

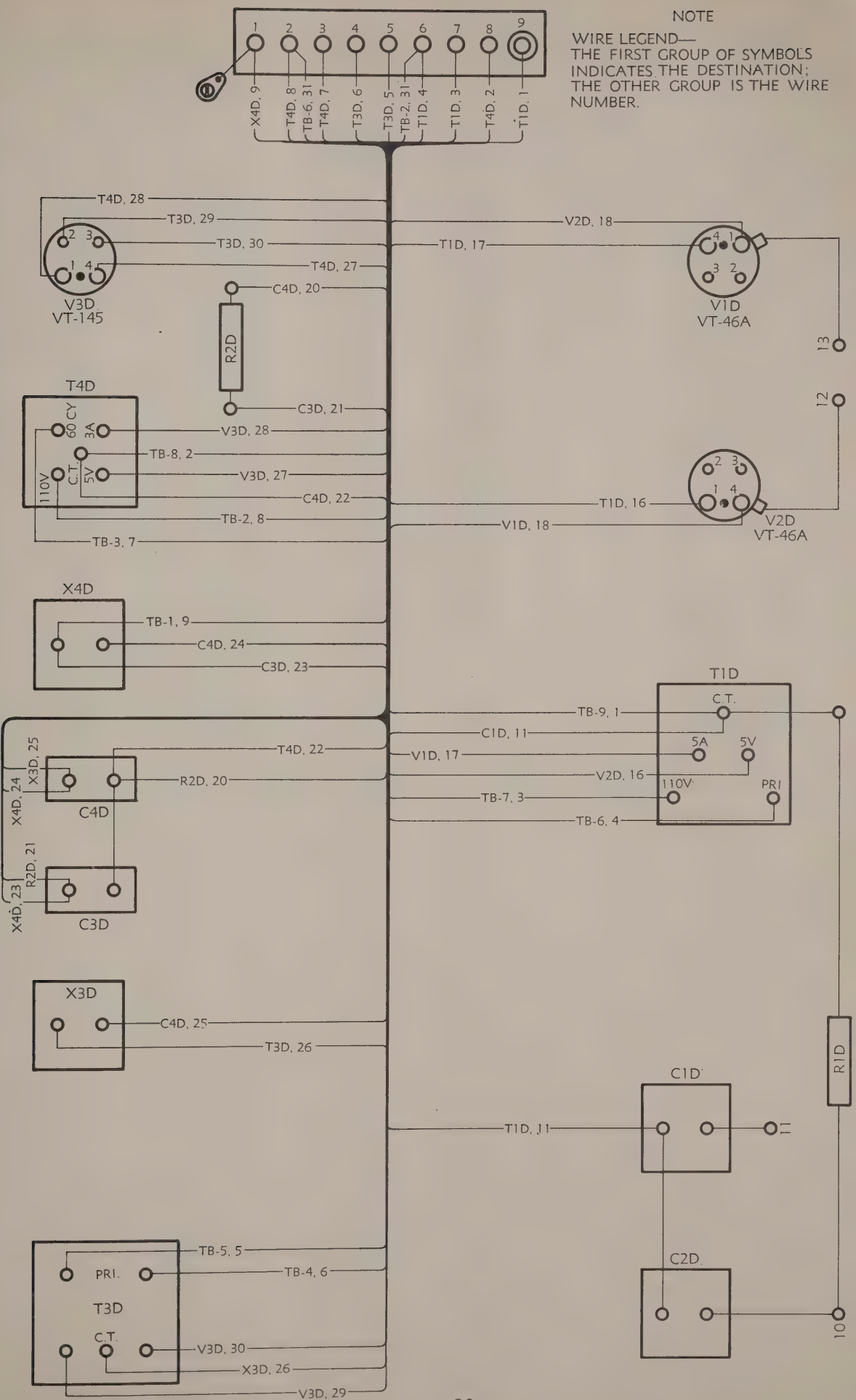


FIG. 30. 1500/350-VOLT POWER SUPPLY CONNECTION DIAGRAM

WIRING CHART FOR 1500/350 VOLT POWER SUPPLY—RC-52-D

Wire No.	From	To	Description		Length	Remarks
			Wire Size	Insulation		
1	T1-D	TB-9	20	5000V	22	WH-RD-OR-YL
2	T4-D	TB-8	20	1000V	19	WH-OR
3	T1-D	TB-7	20	1000V	25	WH-BK
4	T1-D	TB-6	20	1000V	26	WH-BK
5	T3-D	TB-5	20	1000V	28	WH-BN-YL
6	T3-D	TB-4	20	1000V	28	WH-BN-YL
7	T4-D	TB-3	20	1000V	15	WH-BN
8	T4-D	TB-2	20	1000V	15	WH-BN
9	X4-D	TB-1	20	1000V	18	WH-RD-GN
11	T1-D	C1-D	20	5000V	14	WH-RD-OR-YL
16	T1-D	V2-D	14	5000V	14	WH-BK
17	T1-D	V1-D	14	5000V	20	WH-BK
18	V1-D	V2-D	14	5000V	15	WH-BK
20	C4-D	R2-D	20	1000V	16	WH-YL
21	C3-D	R2-D	20	1000V	13	WH-RD-GN
22	T4-D	C4-D	20	1000V	14	WH-OR
23	X4-D	C3-D	20	1000V	12	WH-RD-GN
24	X4-D	C4-D	20	1000V	11	BN
25	X3-D	C4-D	20	1000V	16	BN
26	T3-D	X3-D	20	1000V	12	BN
27	T4-D	V3-D	20	5000V	14	WH-RD-YL-BL
28	T4-D	V3-D	20	5000V	14	WH-RD-YL-BL
29	T3-D	V3-D	20	5000V	27	WH-RD-YL-GN
30	T3-D	V3-D	20	5000V	27	WH-RD-YL-GN
31	V3-D-2	V3-D-6	20	1000V	11	WH-BN
Above wires cabled together.						
12	C1-D	C2-D	12	.....	4	BUS
13	T1-D	R1-D	20	5000V	3	WH-RD-OR-YL
14	C1-D	Term. 11	20	5000V	3	WH-RD-OR-YL
15	C2-D	R1-D	20	5000V	3	WH-RD-OR-YL
19	C3-D	C4-D	12	.....	3	BUS
Wires 12, 13, 14, 15, and 19 are NOT IN CABLE						

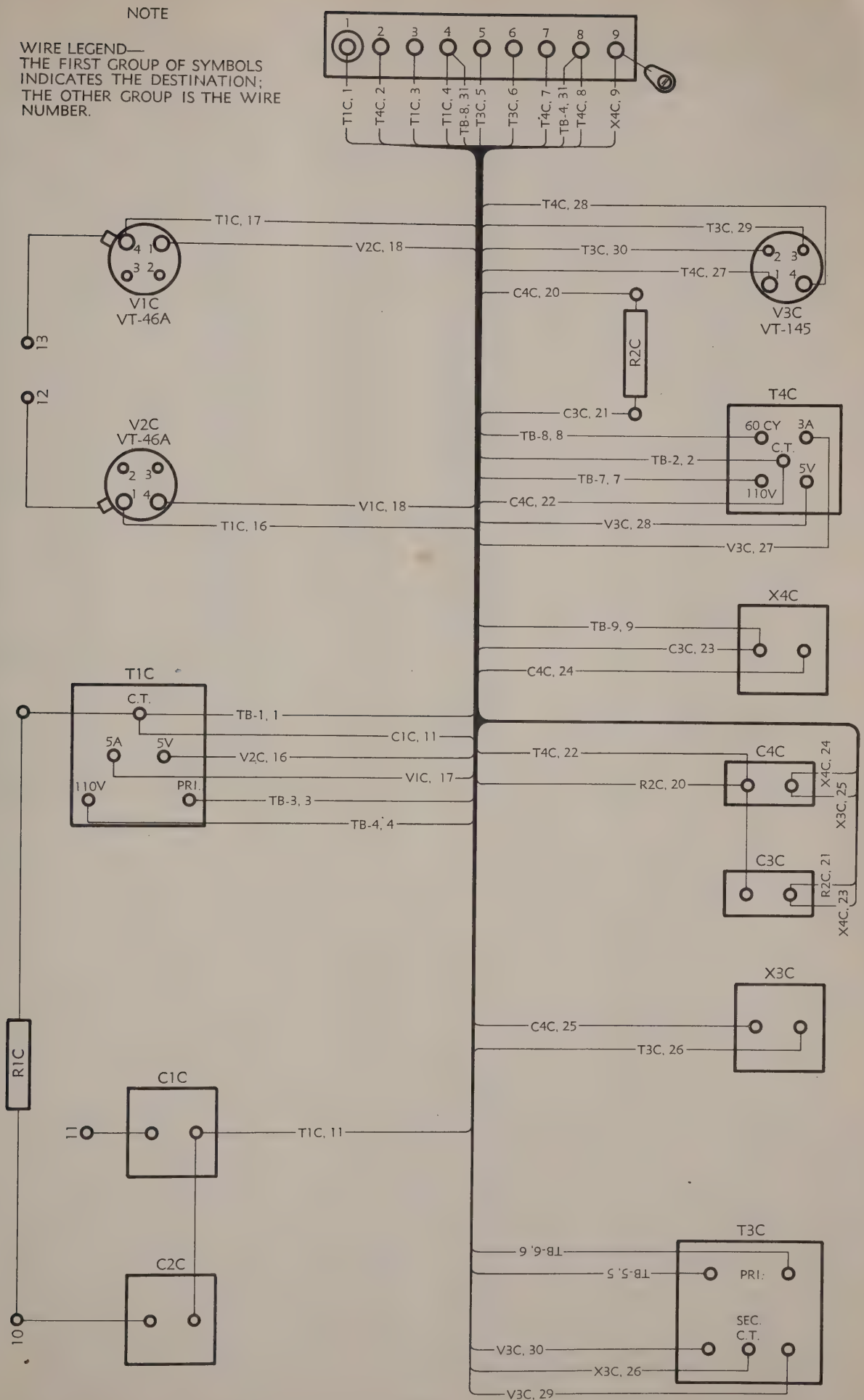


FIG. 31. 1600/400-VOLT POWER SUPPLY CONNECTION DIAGRAM

WIRING CHART FOR 1600/400 VOLT POWER SUPPLY—RC-52-D

Wire No.	From	To	Description		Length	Remarks
			Wire Size	Insulation		
1	T1-C	TB-1	20	5000V	18	WH-RD-OR-YL
2	T4-C	TB-2	20	1000V	18	WH-OR
3	T1-C	TB-3	20	1000V	24	WH-BK
4	T1-C	TB-4	20	1000V	25	WH-BK
5	T3-C	TB-5	20	1000V	27	WH-YL-BN
6	T3-C	TB-6	20	1000V	28	WH-YL-BN
7	T4-C	TB-7	20	1000V	15	WH-BN
8	T4-C	TB-8	20	1000V	17	WH-BN
9	X4-C	TB-9	20	1000V	18	WH-RD-GN
11	T1-C	C1-C	20	5000V	14	WH-RD-OR-YL
16	T1-C	V2-C	14	5000V	14	WH-BK
17	T1-C	V1-C	14	5000V	20	WH-BK
18	V1-C	V2-C	14	5000V	16	WH-BK
20	C4-C	R2-C	20	1000V	17	WH-YL
21	C3-C	R2-C	20	1000V	13	WH-RD-GN
22	T4-C	C4-C	20	1000V	12	WH-OR
23	X4-C	C3-C	20	1000V	13	WH-RD-GN
24	X4-C	C4-C	20	1000V	11	BN
25	X3-C	C4-C	20	1000V	16	BN
26	T3-C	X3-C	20	1000V	11	BN
27	T4-C	V3-C	20	5000V	14	WH-RD-YL-BL
28	T4-C	V3-C	20	5000V	14	WH-RD-YL-BL
29	T3-C	V3-C	20	5000V	27	WH-RD-YL-GN
30	T3-C	V3-C	20	5000V	27	WH-RD-YL-GN
31	TB-4	TB-8	20	1000V	11	WH-BN
The above wires are cabled together.						
12	C1-C	C2-C	12	.....	4	BUS
13	T1-C	R1-C	20	5000V	3	WH-RD-OR-YL
14	C1-C	Term. 11	20	5000V	3	WH-RD-OR-YL
15	C2-C	R1-C	20	5000V	3	WH-RD-OR-YL
19	C3-C	C4-C	12	.....	3	BUS
Wires 12, 13, 14, 15 and 19 are NOT IN CABLE.						

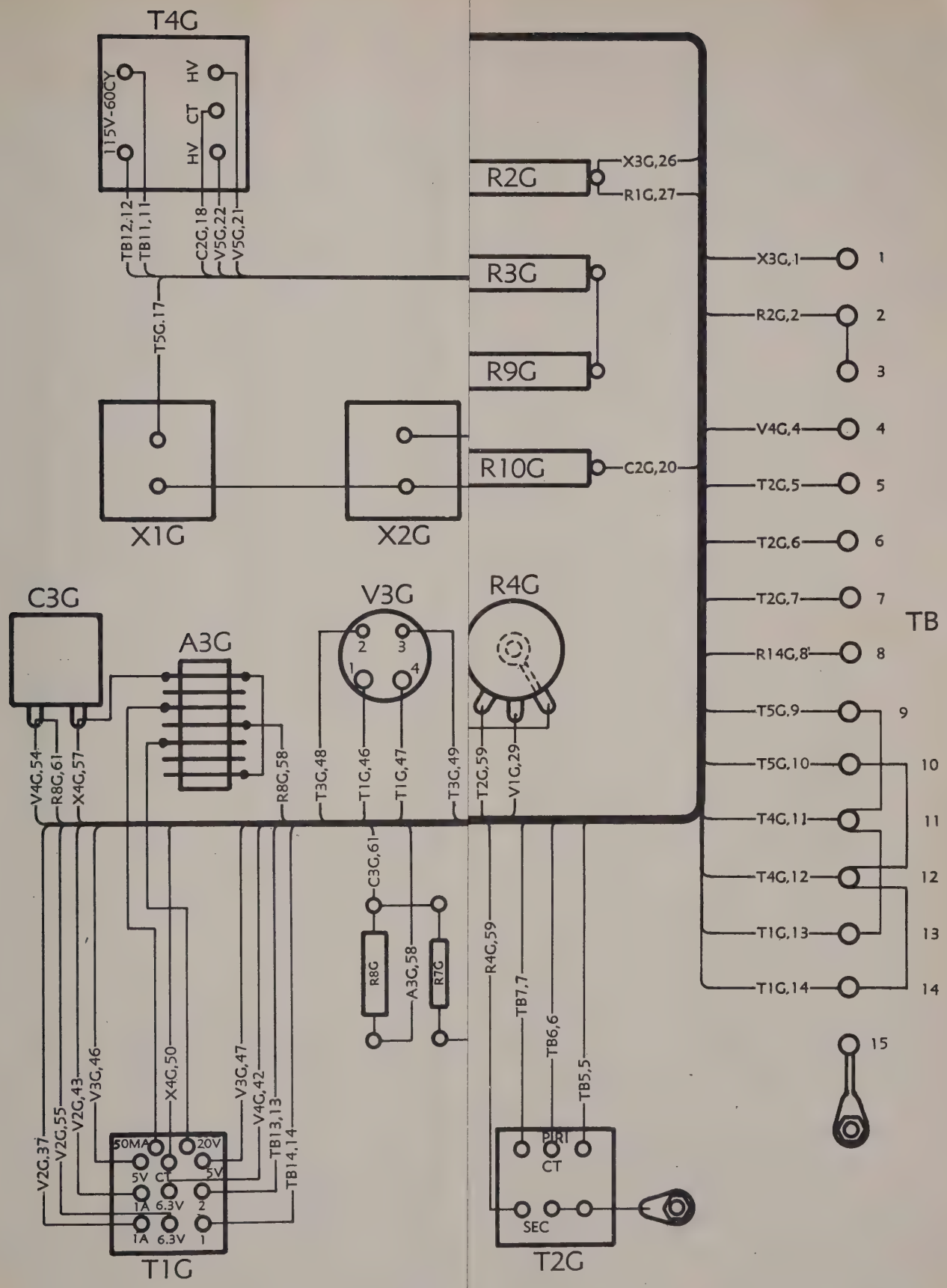


FIG. 32. BIAS SUPPLY AND KEYER CONNECTION DIAGRAM

NOTE

IRE LEGEND—
HE FIRST GROUP OF SYMBOLS INDICATES
HE DESTINATION; THE OTHER GROUP
THE WIRE NUMBER.

T4G
T5G
V5G
X3G
X1G
X2G
C1G
C2G
C8G
R2G
R3G
R9G
R10G
TB
C3G
A3G
V3G
V4G
V2G
V1G
R4G
T1G
X4G
T3G
T2G
C7G
C5G
C4G
OUTPUT
INPUT
BOTTOM VIEW

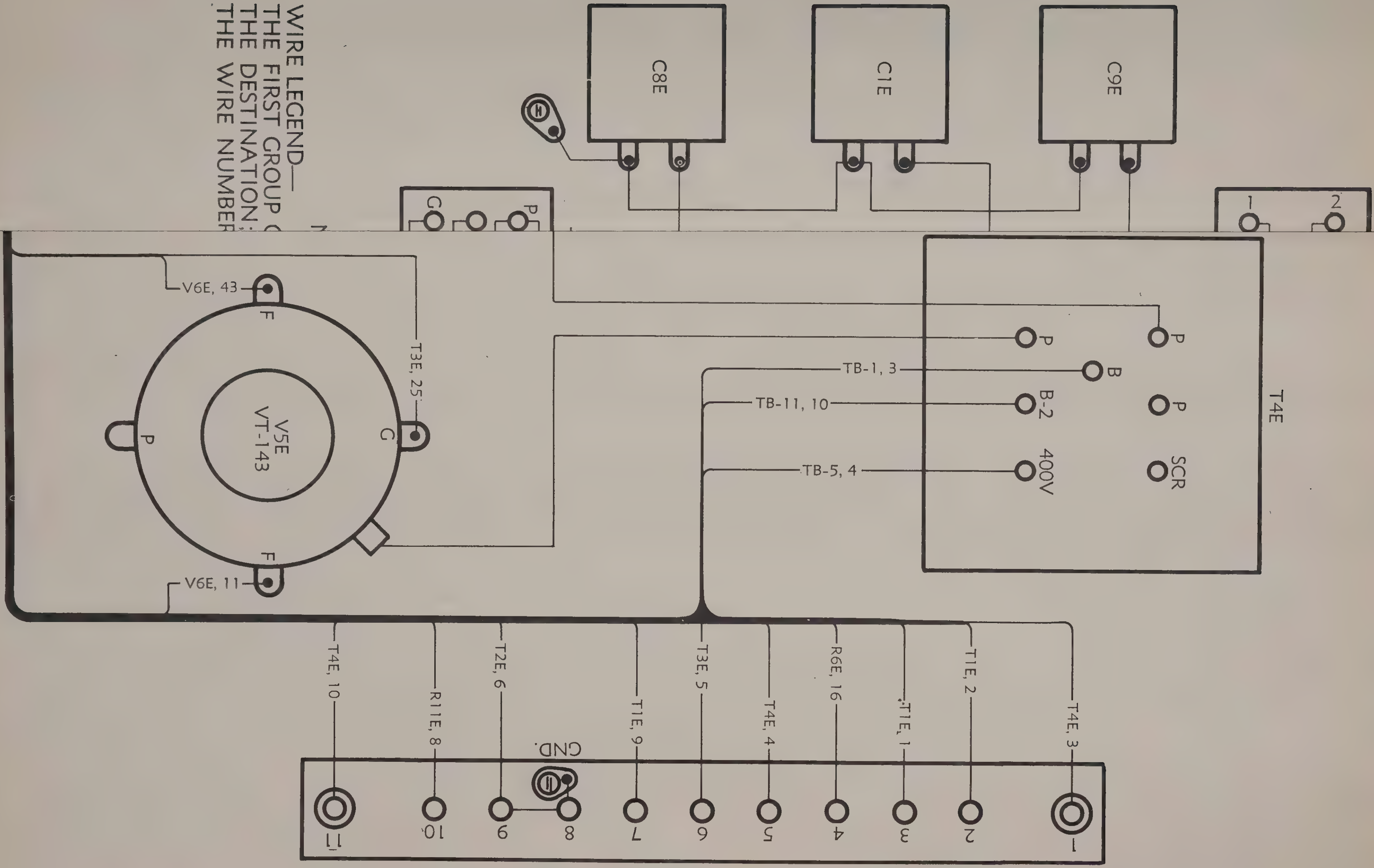
FIG. 32. BIAS SUPPLY AND KEYER CONNECTION DIAGRAM

NOTE

WIRE LEGEND—
THE FIRST GROUP OF SYMBOLS INDICATES THE DESTINATION; THE OTHER GROUP IS THE WIRE NUMBER.

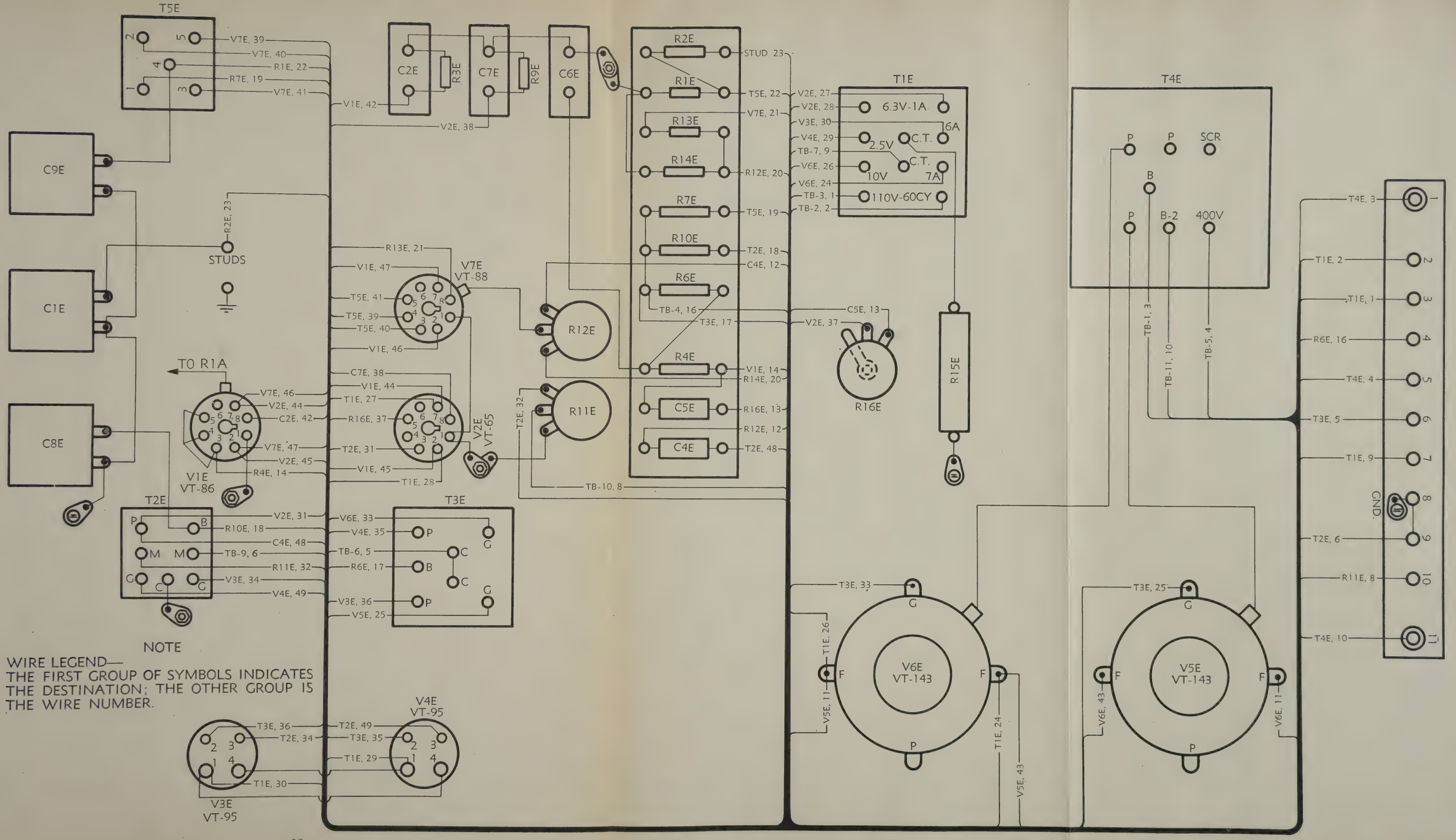
WIRING CHART FOR BIAS SUPPLY AND KEYER CHASSIS—RC-52-D

Wire No.	From	To	Description		Length	Remarks
			Wire Size	Insulation		
1	TB-1	X3-G	20	1000V	18	WH-OR-BL
2	TB-2	R2-G	20	1000V	16	YL
4	TB-4	V4-G	20	1000V	27	WH
5	TB-5	T2-G	20	1000V	16	WH-BK (Shielded)
6	TB-6	T2-G	20	1000V	16	WH-GN (Shielded)
7	TB-7	T2-G	20	1000V	16	WH-BK (Shielded)
8	TB-8	R14-G	29	1000V	24	BL
9	TB-9	T5-G	20	1000V	32	WH-BK
10	TB-10	T5-G	20	1000V	32	WH-BK
11	TB-11	T4-G	20	1000V	36	WH-BN
12	TB-12	T4-G	20	1000V	39	WH-BN
13	TB-13	T1-G	20	1000V	27	WH-RD
14	TB-14	T1-G	20	1000V	28	WH-RD
17	T5-G	X1-G	20	1000V	17	BN
18	T4-G	C2-G	20	1000V	14	WH-OR-GN
20	R10-G	C2-G	20	1000V	27	WH-OR-GN
21	V5-G	T4-G	20	5000V	18	WH-RD-OR-GN
22	V5-G	T4-G	20	5000V	18	WH-RD-OR-GN
23	V5-G	T5-G	14	1000V	16	WH-OR-GN-BL
24	V5-G	T5-G	14	1000V	12	WH-OR-GN-BL
25	X3-G	C8-G	20	1000V	12	WH-OR-BL
26	X3-G	R2-G	20	1000V	18	WH-GN-BN
27	R2-G	R1-G	20	1000V	26	WH-GN-BN
28	R9-G	R7-G	20	1000V	38	WH-OR
29	V1-G	R4-G	20	1000V	14	WH (Shielded)
30	V1-G	V2-G	20	1000V	14	WH-YL-BN
31	V1-G	V2-G	20	1000V	14	WH-YL-BN
32	V1-G	R12-G	20	1000V	14	WH-RD-GN
33	V1-G	R11-G	20	1000V	12	WH-RD-BK
34	V1-G	C4-G	20	1000V	13	WH-RD-BK
35	V2-G	R13-G	20	1000V	11	GN
36	V2-G	R5-G	20	1000V	10	OR
37	V2-G	T1-G	20	1000V	20	WH-YL-BN
38	V2-G	C5-G	20	1000V	13	OR
39	T3-G	R12-G	20	1000V	11	WH-OR-BL
40	V2-G	T3-G	20	1000V	12	WH-RD-BL
41	C7-G	R14-G	20	1000V	12	YL
42	V4-G	T1-G	20	1000V	16	WH-OR-YL
43	V4-G	T1-G	20	1000V	16	WH-OR-YL
44	V4-G	R6-G	20	1000V	10	WH-GN
45	V4-G	X4-G	20	1000V	10	WH-GN
46	V3-G	T1-G	14	1000V	12	WH-RD-GN-BN
47	V3-G	T1-G	14	1000V	12	WH-RD-GN-BN
48	V3-G	T3-G	20	1000V	16	WH-OR-BK
49	V3-G	T3-G	20	1000V	16	WH-OR-BK
50	T1-G	X4-G	20	1000V	15	WH-RD-GN
51	T3-G	X4-G	20	1000V	15	WH-RD-YL
52	V2-G	T3-G	20	1000V	12	RD
54	V4-G	C3-G	20	1000V	18	WH
55	V2-G	T1-G	20	1000V	20	WH-YL-BN
56	R6-G	X4-G	20	1000V	10	WH-BN
57	C3-G	X4-G	20	1000V	17	WH-BN
58	A3-G	R8-G	20	1000V	16	WH-BK
59	T2-G	R4-G	20	1000V	10	WH (Shielded)
60	V1-G	R11-G	20	1000V	11	WH
61	C3-G	R8-G	20	1000V	17	BL



WIRE LEGEND—
THE FIRST GROUP
THE DESTINATION;
THE WIRE NUMBER

FIG. 33. VOICE AMPLIFIER AND MODULATOR CONNECTION DIAGRAM



NOTE

WIRE LEGEND—
THE FIRST GROUP OF SYMBOLS INDICATES THE DESTINATION; THE OTHER GROUP IS THE WIRE NUMBER.

FIG. 33. VOICE AMPLIFIER AND MODULATOR CONNECTION DIAGRAM

WIRING CHART FOR VOICE AMP. & MODULATOR—RC-52-D

Wire No.	From	To	Description		Length	Remarks
			Wire Size	Insulation		
1	TB-3	T1-E	20	1000V	39	WH-GN
2	TB-2	T1-E	20	1000V	39	WH-GN
3	TB-1	T4-E	20	5000V	29	WH-RD-OR-BK
4	TB-5	T4-E	20	1000V	27	RD
5	TB-6	T3-E	20	1000V	37	WH-RD-GN
6	TB-9	T2-E	20	1000V	34	WH-OR-BK
8	TB-10	R11-E	20	1000V	31	WH-RD-YL
9	TB-7	T1-E	20	1000V	36	WH-OR-BL
10	TB-11	T4-E	20	5000V	31	WH-RD-BL-BK
11	V5-E	V6-E	14	1000V	25	WH-GN-BL-BK
12	C4-E	R12-E	20	1000V	14	BN
13	C5-E	R16-E	20	1000V	12	WH-BN (Shielded)
14	R4-E	V1-E	20	1000V	28	WH-YL (Shielded)
16	TB-4	R6-E	20	1000V	37	WH-OR-GN
17	T3-E	R6-E	20	1000V	29	WH-OR-GN
18	T2-E	R10-E	20	1000V	31	WH-RD-BK
19	T5-E	R7-E	20	1000V	40	GN
20	R14-E	R12-E	20	1000V	15	WH-OR-YL
21	R13-E	V7-E	20	1000V	39	WH-BN-YL
22	T5-E	R1-E	20	1000V	43	WH-GN-BN
23	R2-E	Stud	20	1000V	41	WH-BK (Shielded)
24	T1-E	V6-E	14	1000V	28	WH-GN-BL-BK
25	T3-E	V5-E	20	1000V	32	WH-GN (Shielded)
26	T1-E	V6-E	14	1000V	19	WH-GN-BL-BK
27	T1-E	V2-E	20	1000V	34	WH-OR
28	T1-E	V2-E	20	1000V	34	WH-OR
29	T1-E	V4-E	14	1000V	28	WH-YL-GN-BL
30	T1-E	V3-E	14	1000V	28	WH-YL-GN-BL
31	T2-E	V2-E	20	1000V	10	WH-RD (Shielded)
32	T2-E	R11-E	20	1000V	27	WH-BK
33	T3-E	V6-E	20	1000V	24	WH-GN (Shielded)
34	T2-E	V3-E	20	1000V	12	WH-OR (Shielded)
35	T3-E	V4-E	20	1000V	11	BL
36	T3-E	V3-E	20	1000V	12	BL
37	V2-E	R16-E	20	1000V	31	WH-GN (Shielded)
38	V2-E	C7-E	20	1000V	14	YL
39	T5-E	V7-E	20	1000V	14	WH-YL
40	T5-E	V7-E	20	1000V	15	OR
41	T5-E	V7-E	20	1000V	12	WH-OR-BN
42	V1-E	C2-E	20	1000V	11	WH
43	V5-E	V6-E	14	1000V	20	WH-GN-BL-BK
44	V1-E	V2-E	20	1000V	6	WH-OR
45	V1-E	V2-E	20	1000V	6	WH-OR
46	V1-E	V7-E	20	1000V	8	WH-OR
47	V1-E	V7-E	20	1000V	8	WH-OR
48	T2-E	C4-E	20	1000V	24	WH-RD (Shielded)
49	T2-E	V4-E	20	1000V	12	WH-OR (Shielded)

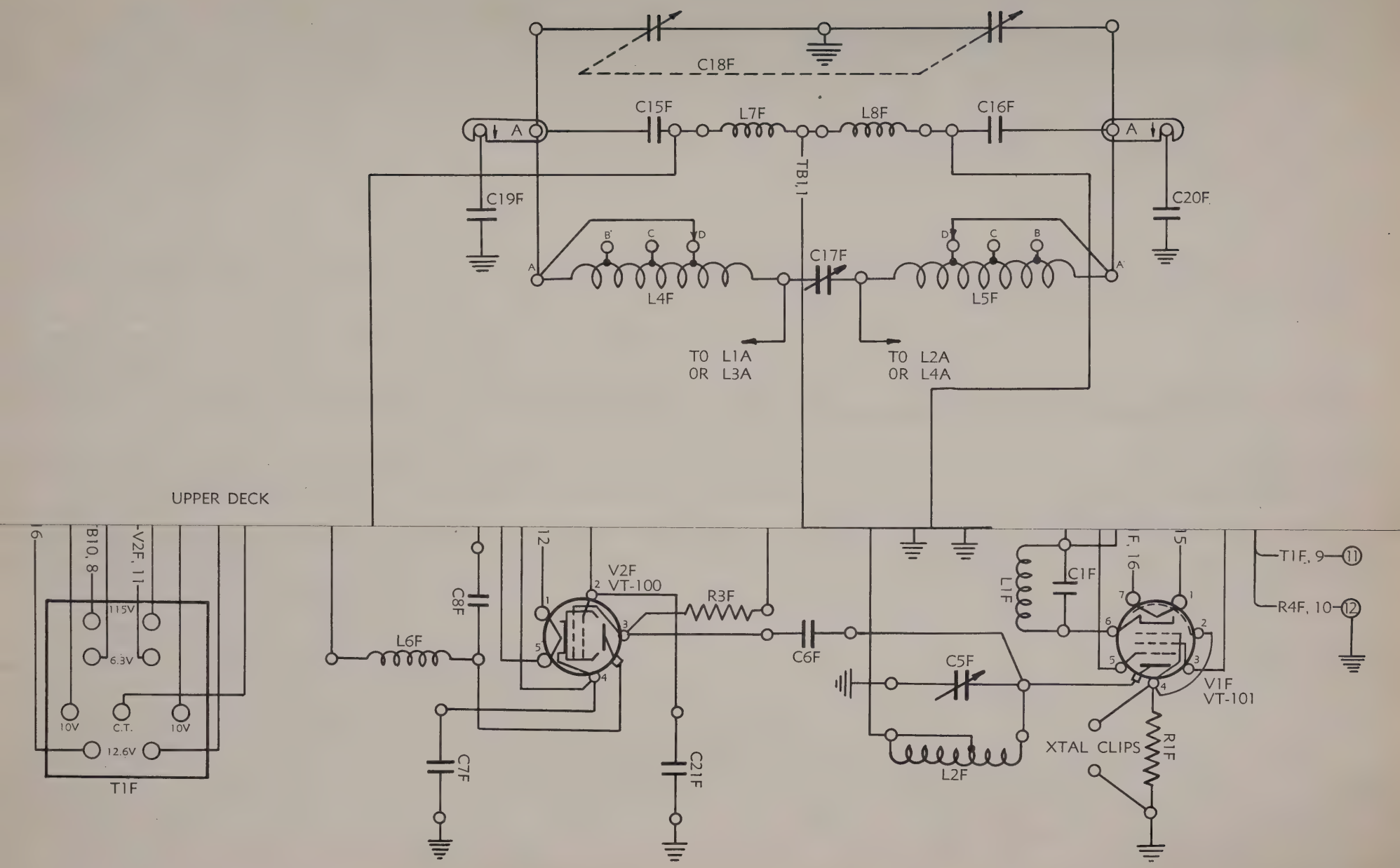
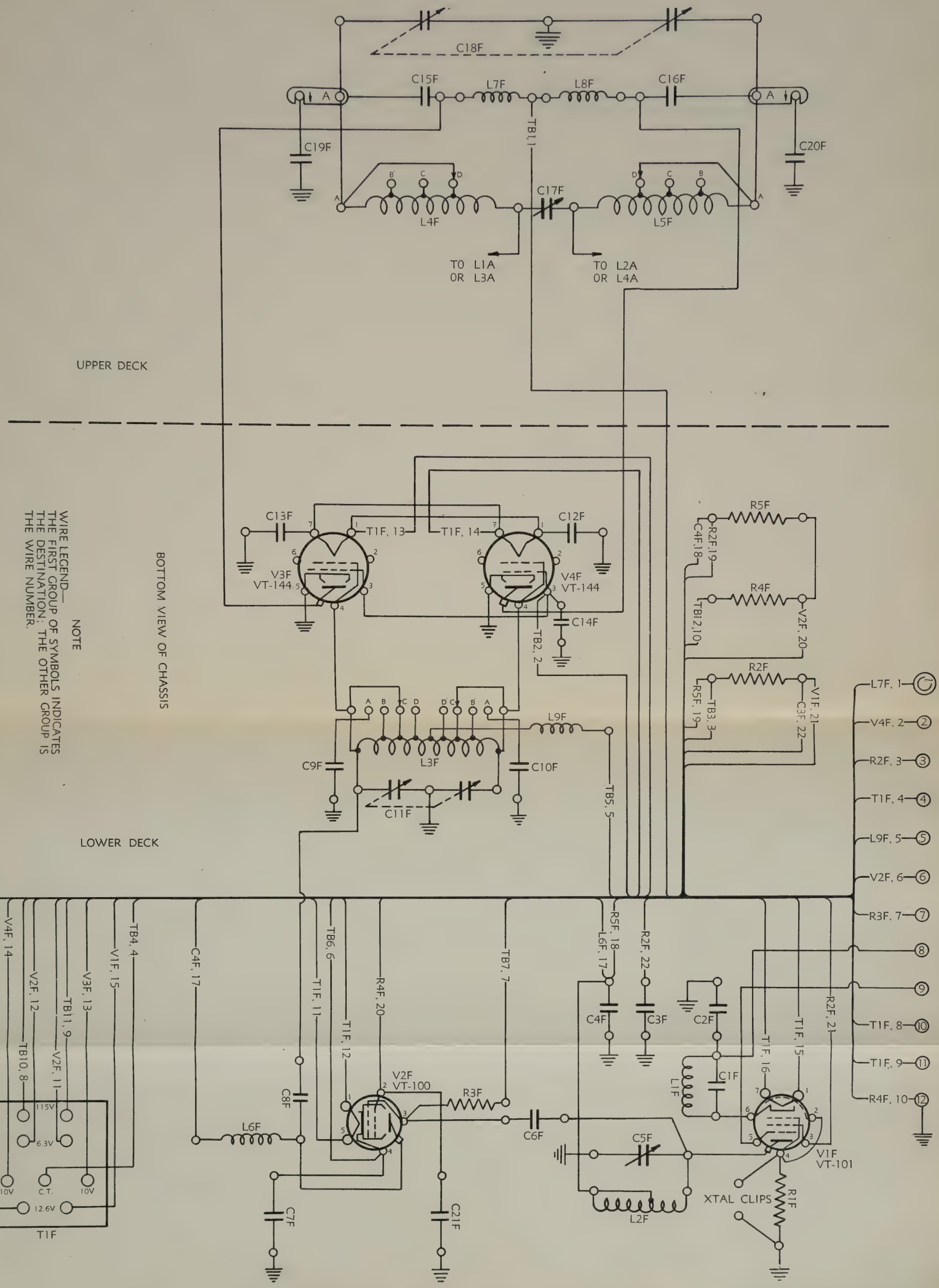


FIG. 34. RADIO FREQUENCY UNIT CONNECTION DIAGRAM



BOTTOM VIEW OF CHASSIS

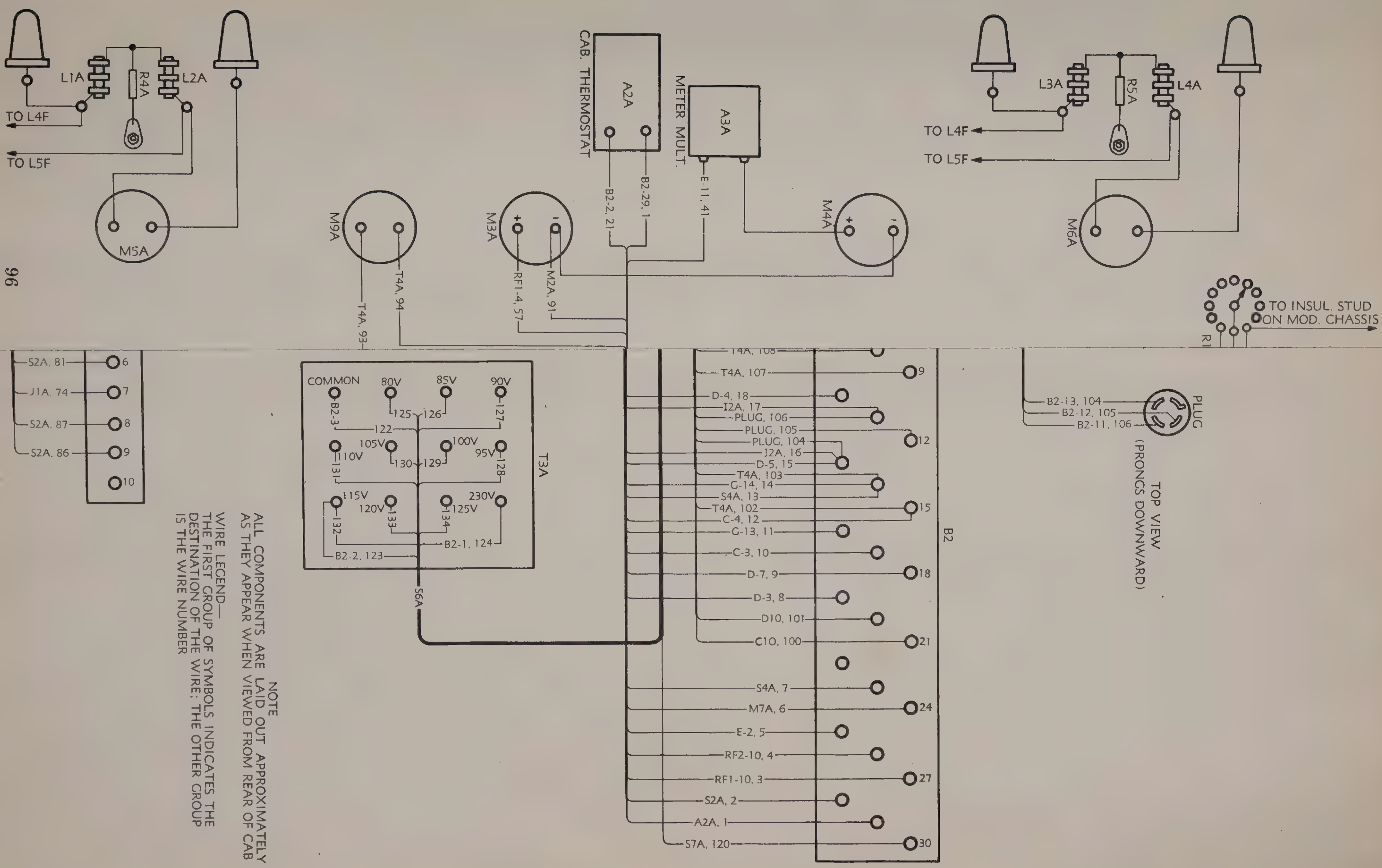
NOTE

WIRE LEGEND— THE FIRST GROUP OF SYMBOLS INDICATES THE DESTINATION; THE OTHER GROUP IS THE WIRE NUMBER.

FIG. 34. RADIO FREQUENCY UNIT CONNECTION DIAGRAM

WIRING CHART FOR R-F UNIT—RC-52-D

Wire No.	From	To	Description		Length	Remarks
			Wire Size	Insulation		
1	TB-1	L7-F	20	5000V	25	WH-RD-OR-BL
2	TB-2	V4-F	20	5000V	16	WH-RD-YL-BK
3	TB-3	R2-F	20	1000V	10	WH-OR-BL
4	TB-4	T1-F	20	1000V	33	WH-OR
5	TB-5	L-9F	20	1000V	20	WH-GN-BN
6	TB-6	V2-F	20	1000V	25	WH
7	TB-7	R3-F	20	1000V	22	WH-RD
8	TB-10	T1-F	20	1000V	35	WH-BK
9	TB-11	T1-F	20	1000V	35	WH-BK
10	TB-12	R4-F	20	1000V	21	WH-RD-GN
11	T1-F	V2-F	20	1000V	17	OR
12	T1-F	V2-F	20	1000V	17	OR
13	T1-F	V3-F	12	1000V	40	WH-YL-BN-BK
14	T1-F	V4-F	12	1000V	40	WH-YL-BN-BK
15	T1-F	V1-F	20	1000V	38	BN
16	T1-F	V1-F	20	1000V	38	BN
17	C4-F	L6-F	20	1000V	18	WH-OR-BL
18	R5-F	C4-F	20	1000V	15	WH-OR-BL
19	R2-F	R5-F	20	1000V	11	WH-OR-BL
20	V2-F	R4-F	20	1000V	21	WH-RD-BK
21	V1-F	R2-F	20	1000V	18	WH-YL-BN
22	R2-F	C3-F	20	1000V	10	WH-YL-BN



NOTE
ALL COMPONENTS ARE LAID OUT APPROXIMATELY AS THEY APPEAR WHEN VIEWED FROM REAR OF CAB

WIRE LEGEND—
THE FIRST GROUP OF SYMBOLS INDICATES THE DESTINATION OF THE WIRE; THE OTHER GROUP IS THE WIRE NUMBER

FIG. 35. CABINET CONNECTION DIAGRAM

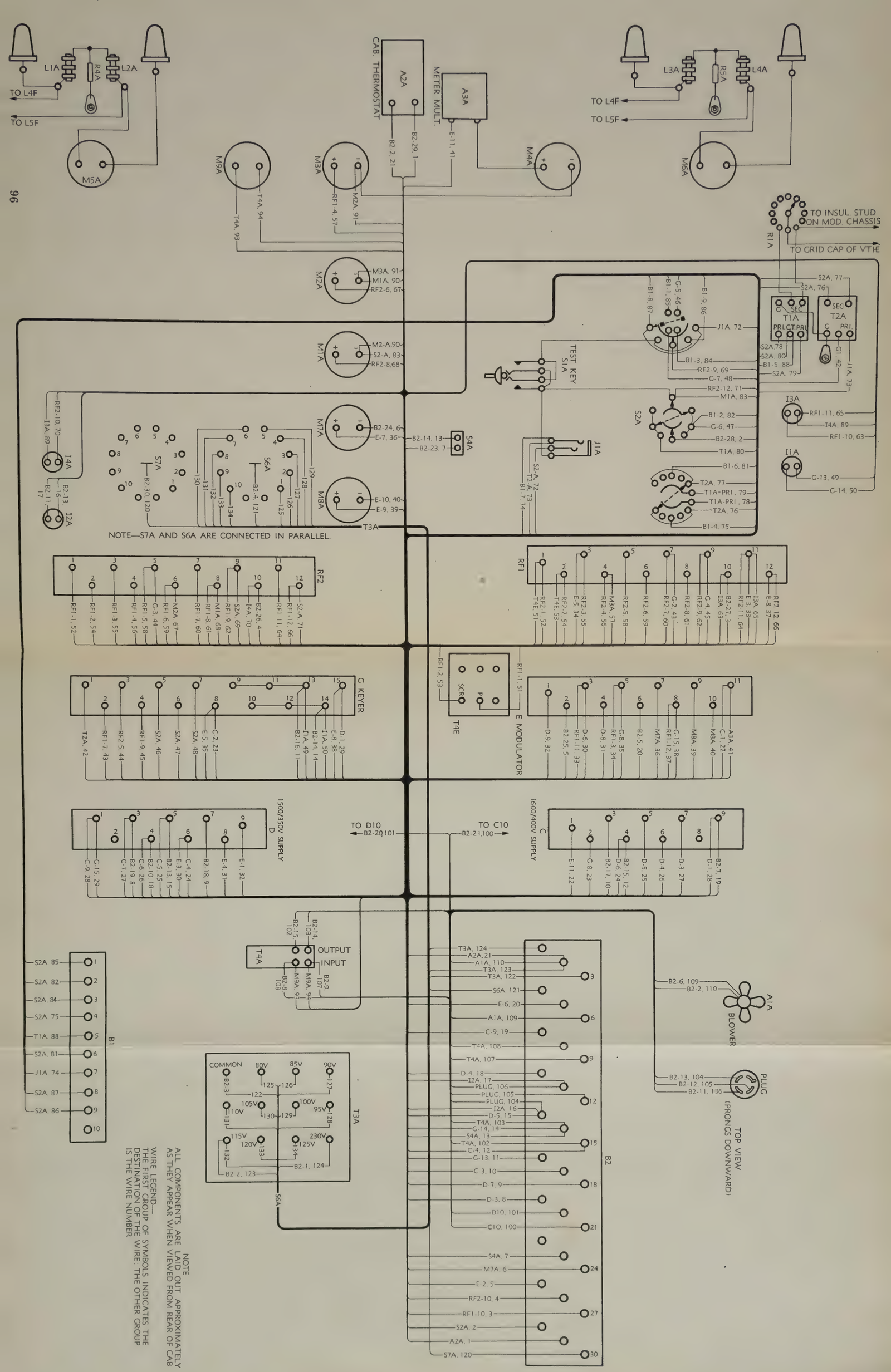


FIG. 35. CABINET CONNECTION DIAGRAM

WIRING CHART FOR MAIN CABINET WIRING—RC-52-D

Wire No.	From	To	Description		Length	Remarks
			Wire Size	Insulation		
1	B2-29	A2-A	20	1000V	115	BK
2	B2-28	S2-A	20	1000V	78	WH-RD-BK
3	B2-27	RF1-10	14	1000V	60	WH-YL-GN-BL
4	B2-26	RF2-10	14	1000V	54	WH-RD-GN
5	B2-25	E2	14	1000V	36	WH-GN-BL-BK
6	B2-24	M7-A	20	1000V	70	WH-BK
7	B2-23	S4-A	20	1000V	82	WH-GN-BN
8	B2-19	D3	14	1000V	30	WH-YL-GN-BL
9	B2-18	D7	20	1000V	28	WH-RD-BL
10	B2-17	C3	20	1000V	28	WH-OR-GN
11	B2-16	G13	14	1000V	48	WH-GN-BL-BK
12	B2-15	C4	14	1000V	26	WH-RD-GN
13	B2-14	S4-A	20	1000V	77	WH-GN-BN
14	B2-14	G14	14	1000V	34	WH-YL-GN-BL
15	B2-13	D5	14	1000V	25	WH-YL-GN-BL
16	B2-13	I2-A	20	1000V	74	BL
17	B2-11	I2-A	20	1000V	73	BL
18	B2-10	D4	14	1000V	26	WH-YL-BL-GN
19	B2-7	C9	14	1000V	27	WH-OR-GN-BL
20	B2-5	E6	20	1000V	33	YL
21	B2-2	A2-A	20	1000V	109	BK
22	C1	E11	20	5000V	45	WH-RD-OR-YEL
23	C2	G8	20	1000V	41	RD
24	C4	D6	14	1000V	32	WH-RD-GN
25	C5	D5	14	1000V	34	WH-YL-GN-BL
26	C6	D4	14	1000V	35	WH-YL-GN-BL
27	C7	D3	14	1000V	37	WH-YL-GN-BL
28	C9	D1	14	1000V	39	WH-OR-GN-BL
29	D1	G15	14	1000V	41	WH-OR-GN-BL
30	D6	E3	14	1000V	42	WH-RD-GN
31	D8	E4	20	1000V	42	OR
32	D9	E1	20	5000V	36	WH-RD-GN-BK
33	E3	RF1-11	14	1000V	43	WH-RD-GN
34	E5	RF1-3	20	1000V	38	RD
35	E5	G8	20	1000V	24	RD
36	E7	M7-A	20	1000V	65	WH-OR
37	E8	RF1-12	14	1000V	45	WH-OR-GN-BL
38	E8	G15	14	1000V	22	WH-OR-GN-BL
39	E9	M8-A	20	1000V	60	WH
40	E10	M8-A	20	1000V	62	WH
41	E11	A3-A	20	5000V	86	WH-RD-OR-BK
42	G1	T2-A	20	1000V	82	WH-BK (Shielded)
43	G2	RF1-7	20	1000V	45	WH-YL-BN
44	G3	RF2-5	20	1000V	44	WH-OR-BN
45	G4	RF1-9	20	1000V	44	WH-OR-BK
46	G5	S2-A	20	1000V	52	WH-GN (Shielded)
47	G6	S2-A	20	1000V	50	WH-YL (Shielded)
48	G7	S2-A	20	1000V	50	WH-GN (Shielded)
49	G13	I1-A	20	1000V	56	GN
50	G14	I1-A	20	1000V	56	GN
51	RF1-1	T4-E	20	5000V	10	WH-RD-OR-YL
52	RF1-1	RF2-1	20	5000V	25	WH-RD-OR-YL
53	RF1-2	T4-E	20	5000V	10	WH-RD-YL-BL
54	RF1-2	RF2-2	20	5000V	26	WH-RD-YL-BL
55	RF1-3	RF2-3	20	1000V	28	RD
56	RF1-4	RF2-4	20	1000V	28	WH-YL
57	RF1-4	M3-A	20	1000V	60	WH-YL
58	RF1-5	RF2-5	20	1000V	28	WH-OR-BN
59	RF1-6	RF2-6	20	1000V	28	WH-GN
60	RF1-7	RF2-7	20	1000V	28	WH-YL-BN
61	RF1-8	RF2-8	20	1000V	28	WH-BN

WIRING CHART FOR MAIN CABINET WIRING—RC-52-D—Continued

Wire No.	From	To	Description		Length	Remarks
			Wire Size	Insulation		
62	RF1-9	RF2-9	20	1000V	28	WH-OR-BK
63	RF1-10	I3A	20	1000V	56	WH-GN-BN
64	RF1-11	RF2-11	14	1000V	28	WH-RD-GN
65	RF1-11	I3A	20	1000V	56	WH-RD-YL
66	RF1-12	RF2-12	14	1000V	28	WH-OR-GN-BL
67	RF2-6	M2A	20	1000V	61	WH-GN
68	RF2-8	M1A	20	1000V	54	WH-BN
69	RF2-9	S2-A	20	1000V	44	WH-OR-BK
70	RF2-10	I4A	20	1000V	46	BN
71	RF2-12	S2-A	14	1000V	42	WH-OR-GN-BL
72	S2-A	J1A	20	1000V	10	WH-BN
73	T2A	J1A	20	1000V	30	WH-YL (Shielded)
74	B1-7	J1A	20	1000V	110	WH-GN (Shielded)
75	B1-4	S2-A	20	1000V	104	WH-RD (Shielded)
76	S2-A	T2A	20	1000V	24	WH-GN (Shielded)
77	S2-A	T2A	20	1000V	24	WH-GN (Shielded)
78	S2-A	T1A	20	1000V	22	WH-RD (Shielded)
79	S2-A	T1A	20	1000V	22	WH-RD
80	S2-A	T1A	20	1000V	22	WH-YL (Shielded)
81	B1-6	S2-A	20	1000V	104	WH-RD (Shielded)
82	B1-2	S2-A	20	1000V	104	WH-YL (Shielded)
83	S2-A	M1A	14	1000V	28	WH-OR-GN-BL
84	B1-3	S2-A	20	1000V	104	WH-YL (Shielded)
85	B1-1	S2-A	20	1000V	104	WH-RD (Shielded)
86	B1-9	S2-A	20	1000V	104	WH-OR-BL
87	B1-8	S2-A	20	1000V	104	WH-BN
88	B1-5	T1A	20	1000V	124	WH-YL (Shielded)
89	I3A	I4A	20	1000V	30	WH-RD-YL
90	M1A	M2A	14	1000V	12	WH-OR-GN-BL
91	M2A	M3A	14	1000V	12	WH-OR-GN-BL
93	M9A	T4A	20	1000V	90	WH-RD
94	M9A	T4A	20	1000V	90	WH-RD
Above Wires Cabled Together.						
100	B2-21	C-10	20	1000V	42	WH-RD-YL
101	B2-20	D-10	20	1000V	50	WH-RD-BL
102	B2-15	T4A	14	1000V	20	WH-YL-GN-BL
103	B2-14	T4A	14	1000V	20	WH-YL-GN-BL
104	B2-13	Plug	12	1000V	44	WH-YL-BN-BK
105	B2-12	Plug	14	1000V	44	WH-YL-GN-BL
106	B2-11	Plug	14	1000V	44	WH-GN-BL-BK
107	B2-9	T4A	14	1000V	18	WH-OR-GN-BL
108	B2-8	T4A	14	1000V	18	WH-OR-GN-BL
109	B2-6	A1A	20	1000V	30	WH-BK
110	B2-2	A1A	20	1000V	30	WH-BK
Wires 100-110 Cabled Together.						
120	B2-30	S7A	12	1000V	78	WH-OR-YL-BN
121	B2-4	S6A	12	1000V	70	WH-YL-GN-BK
122	B2-3	T3A	12	1000V	20	WH-OR-YL-GN
123	B2-2	T3A-115	12	1000V	20	WH-YL-BN-BK
124	B2-1	T3A-230	12	1000V	20	WH-YL-GN-BN
125	S6A	T3A-80	12	1000V	68	WH-YL-BN-BK
126	S6A	T3A-85	12	1000V	68	WH-YL-BN-BK
127	S6A	T3A-90	12	1000V	68	WH-YL-BN-BK
128	S6A	T3A-95	12	1000V	68	WH-YL-BN-BK
129	S6A	T3A-100	12	1000V	68	WH-YL-BN-BK
130	S6A	T3A-105	12	1000V	68	WH-YL-BN-BK
131	S6A	T3A-110	12	1000V	68	WH-YL-BN-BK
132	S6A	T3A-115	12	1000V	68	WH-YL-BN-BK
133	S6A	T3A-120	12	1000V	68	WH-YL-BN-BK
134	S6A	T3A-125	12	1000V	68	WH-YL-BN-BK
Wires 120-134 Cabled together.						

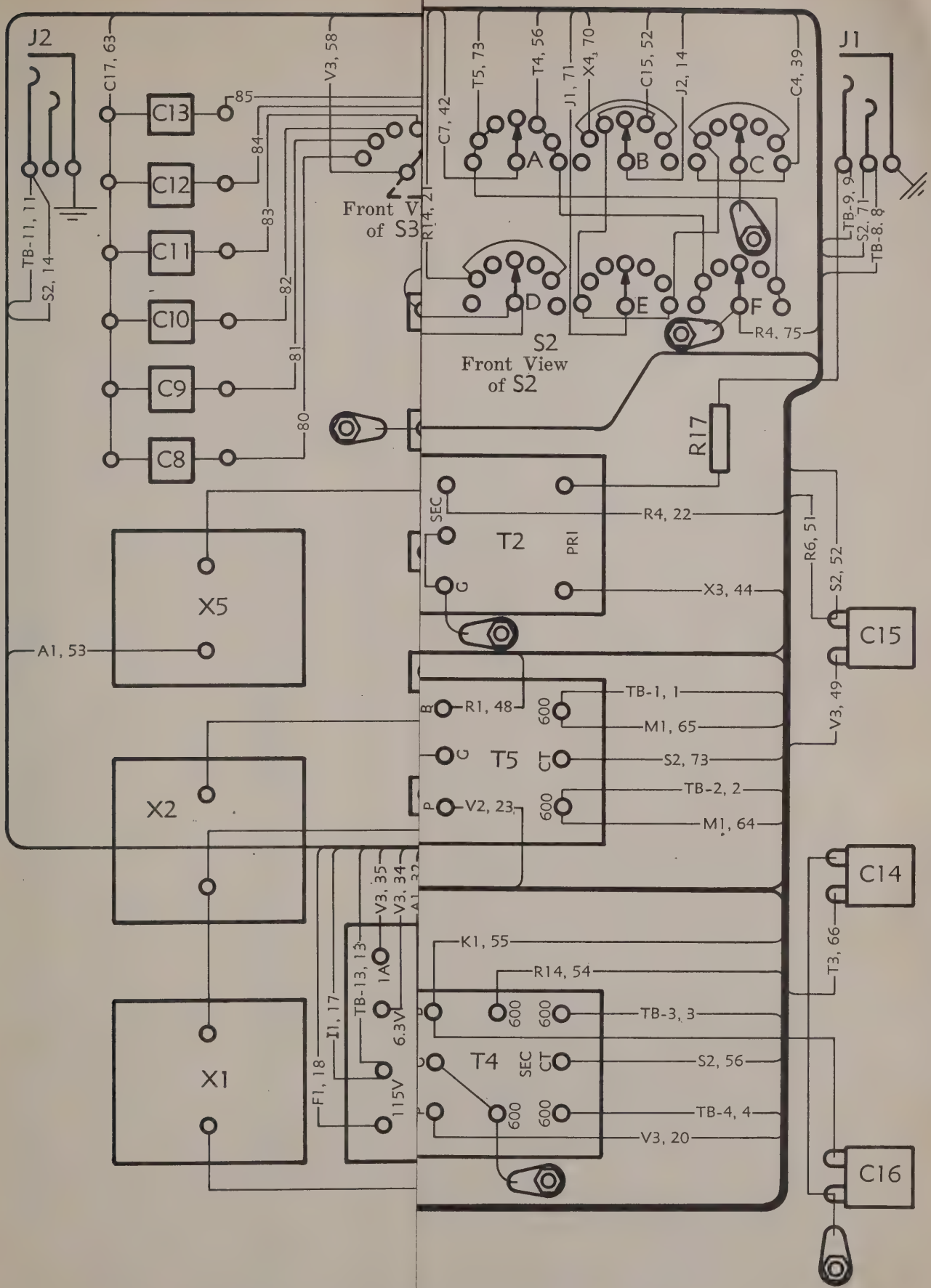


FIG. 37. REMOTE CONTROL UNIT RM-22-D—CONNECTION DIAGRAM

BOTTOM VIEW OF

NOTE

WIRE LEGEND—
THE FIRST GROUP OF SYMBOLS INDICATES THE DESTINATION; THE OTHER GROUP IS THE WIRE NUMBER.

FIG. 37. REMOTE CONTROL UNIT RM-22-D—CONNECTION DIAGRAM

BOTTOM VIEW OF CHASSIS

NOTE

WIRE LEGEND—
THE FIRST GROUP OF SYMBOLS INDICATES THE DESTINATION; THE OTHER GROUP IS THE WIRE NUMBER.

WIRING CHART FOR REMOTE CONTROL UNIT—RM-22-D

Wire No.	From	To	Description		Length	Remarks
			Wire Size	Insulation		
1	T. B.-1	T5	20	1000V	16	WH-BN (Shielded)
2	T. B.-2	T5	20	1000V	16	WH-BN (Shielded)
3	T. B.-3	T4	20	1000V	14	WH-BK (Shielded)
4	T. B.-4	T4	20	1000V	14	WH-BK (Shielded)
5	T. B.-5	K1	20	1000V	24	WH (Shielded)
6	T. B.-6	K1	20	1000V	24	WH (Shielded)
7	T. B.-7	K1	20	1000V	23	WH-RD (Shielded)
8	T. B.-8	J1	20	1000V	28	WH-OR-BK
9	T. B.-9	J1	20	1000V	30	WH (Shielded)
10	T. B.-10	R2	20	1000V	26	WH-RD-GN (Shielded)
11	T. B.-11	J2	20	1000V	24	WH-GN
12	T. B.-12	S1	20	1000V	27	WH-OR
13	T. B.-13	T1	20	1000V	18	WH-OR
14	S2	J2	20	1000V	29	WH-GN
15	S1	F1	20	1000V	12	WH-OR
16	F1	I1	20	1000V	19	WH-OR
17	T1	I1	20	1000V	30	WH-OR
18	T1	F1	20	1000V	25	WH-OR
20	T4	V3	20	1000V	17	WH-RD (Shielded)
21	S2	R14	20	1000V	34	WH-GN (Shielded)
22	T2	R4	20	1000V	20	WH-YL (Shielded)
23	T5	V2	20	1000V	11	WH-BK (Shielded)
24	T1	V1	20	1000V	11	WH-BK
25	T1	V1	20	1000V	9	WH-BK
26	T1	V1	14	1000V	11	WH-GN-BL-BK
27	T1	V1	14	1000V	11	WH-GN-BL-BK
28	T1	S4	20	1000V	14	BL
29	T1	S4	20	1000V	13	BN
30	T1	S4	20	1000V	12	WH-RD-BL
31	T1	S4	20	1000V	12	WH-RD-GN
32	T1	A1	20	1000V	39	WH-BK
33	S2	A1	20	1000V	36	WH-YL
34	T1	V3	20	1000V	14	WH
35	T1	V3	20	1000V	14	WH
36	V2	V3	20	1000V	9	WH
37	V2	V3	20	1000V	9	WH
38	V2	C4	20	1000V	21	WH-OR-YL
39	S2	C4	20	1000V	22	GN
40	X4	C4	20	1000V	12	GN
41	C6	X4	20	1000V	10	GN
42	S2	C7	20	1000V	24	WH-OR-GN
43	X3	C3	20	1000V	9	WH
44	T2	X3	20	1000V	17	WH
45	R1	C2	20	1000V	12	RD
46	R5	C2	20	1000V	14	RD
47	K1	R1	20	1000V	14	RD
48	T5	R1	20	1000V	12	RD
49	V3	C15	20	1000V	16	OR
50	V3	R6	20	1000V	8	OR
51	R6	C15	20	1000V	18	YL
52	S2	C15	20	1000V	19	YL
53	X5	A1	20	1000V	37	WH-RD
54	T4	R14	20	1000V	13	WH-RD-BL
55	T4	K1	20	1000V	25	WH-RD-YL
56	T4	S2	20	1000V	25	WH-OR-BL
57	V2	R4	20	1000V	26	WH-YL (Shielded)
58	V3	S3	20	1000V	25	WH-OR-YL
59	T3	V3	20	1000V	7	WH-OR-YL
60	V3	S3	20	1000V	25	WH-GN-BN

WIRING CHART FOR REMOTE CONTROL UNIT—RM-22-D—Continued

Wire No.	From	To	Description		Length	Remarks
			Wire Size	Insulation		
61	V3	C17	20	1000V	8	WH-RD-BK
62	T3	V3	20	1000V	8	WH-RD-BK
63	C17	C13	20	1000V	32	WH-RD-BK
64	T5	M1	20	1000V	33	WH-BN
65	T5	M1	20	1000V	31	WH-BN
66	T3	C14	20	1000V	12	WH-BN-YL
67	R2	R1	20	1000V	16	BN
68	X3	R1	20	1000V	13	BN
69	C5	X4	20	1000V	9	WH-OR-BN
70	S2	X4	20	1000V	25	WH-OR-BN
71	S2	J1	20	1000V	18	WH-OR-BK
73	T5	S2	20	1000V	20	WH-RD-GN
74	T3	R5	20	1000V	10	WH-YL-BN
75	S2	R4	20	1000V	10	WH-RD-GN
Above wires cabled together.						
80	S3	C8	20	1000V	15	WH-OR
81	S3	C9	20	1000V	15	WH-OR-YL
82	S3	C10	20	1000V	14	WH-OR-BN
83	S3	C11	20	1000V	14	WH-OR-BL
84	S3	C12	20	1000V	13	WH-RD-YL
85	S3	C13	20	1000V	13	WH
Wires 80-85 cabled together.						

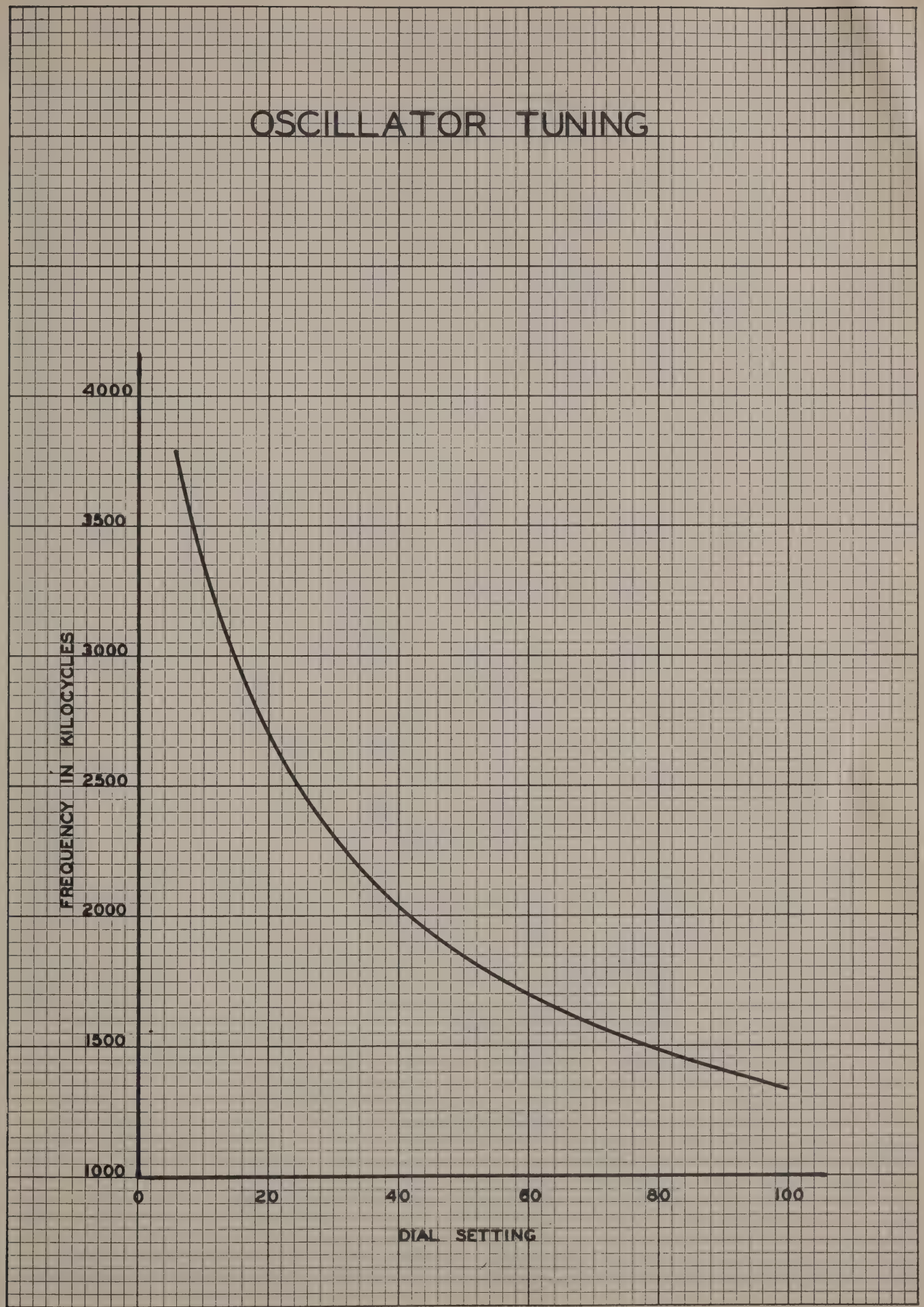


FIG. 38. OSCILLATOR TUNING CURVE

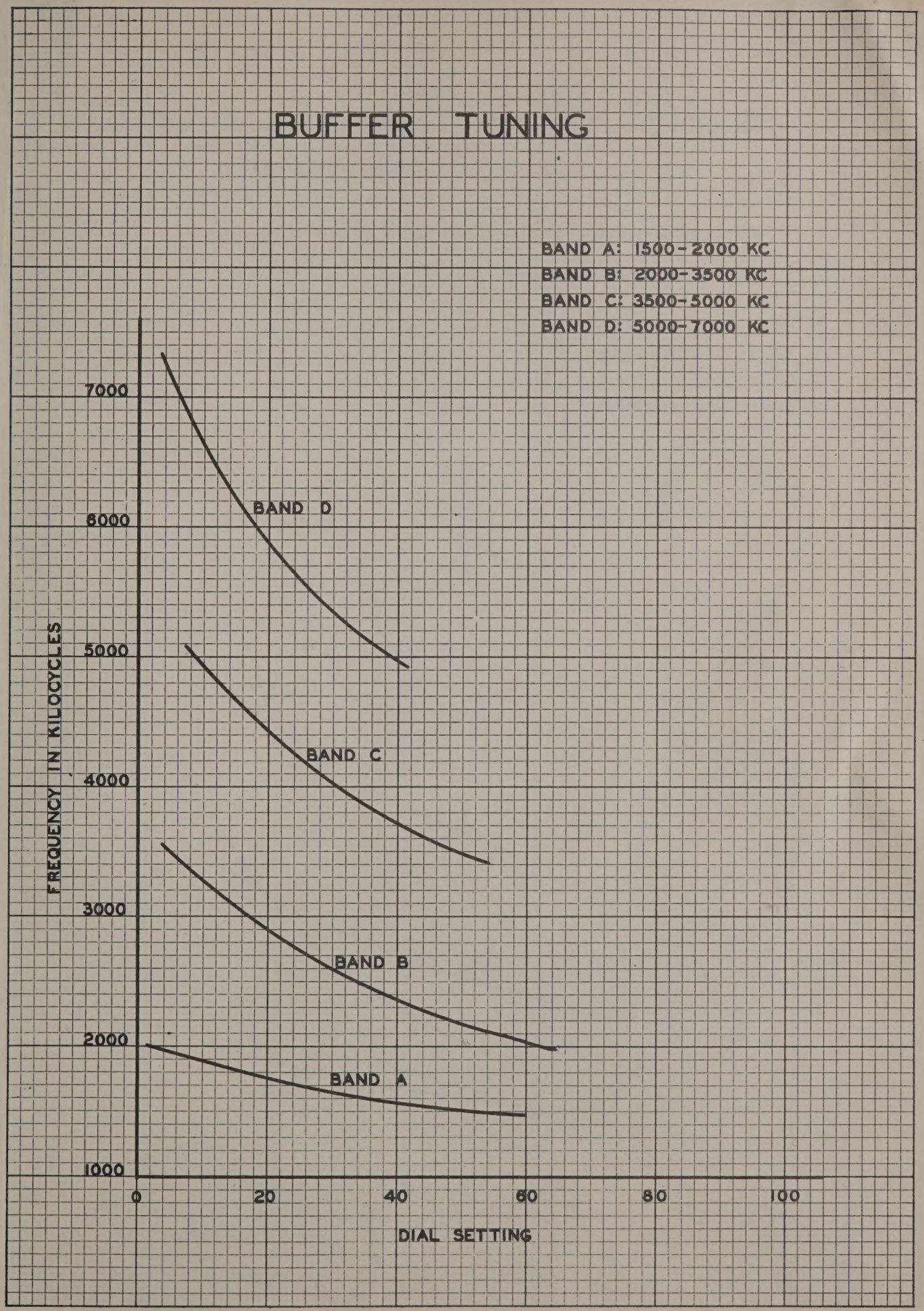


FIG. 39. BUFFER TUNING CURVE

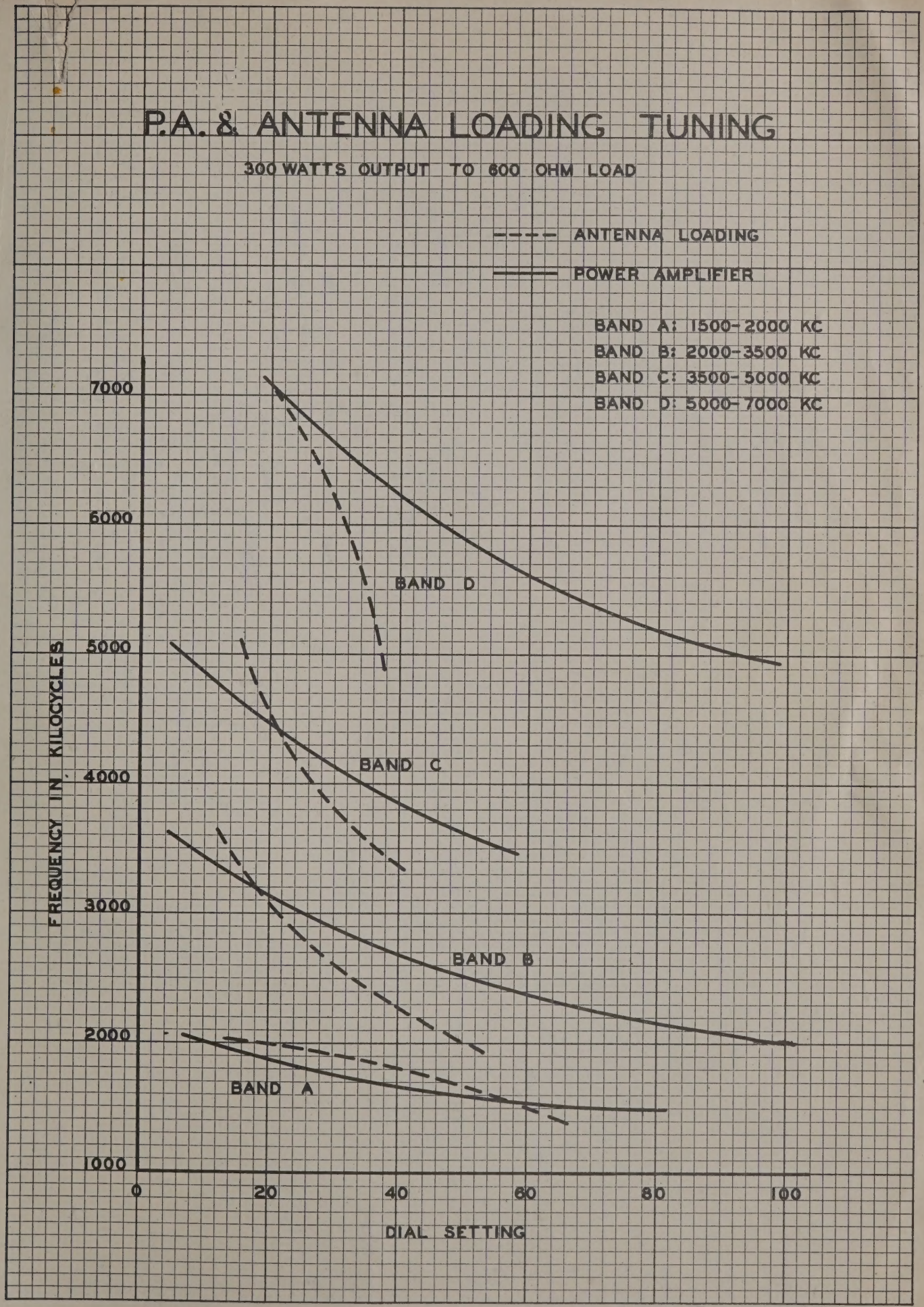


FIG. 40. POWER AMPLIFIER AND ANTENNA LOADING TUNING CURVES